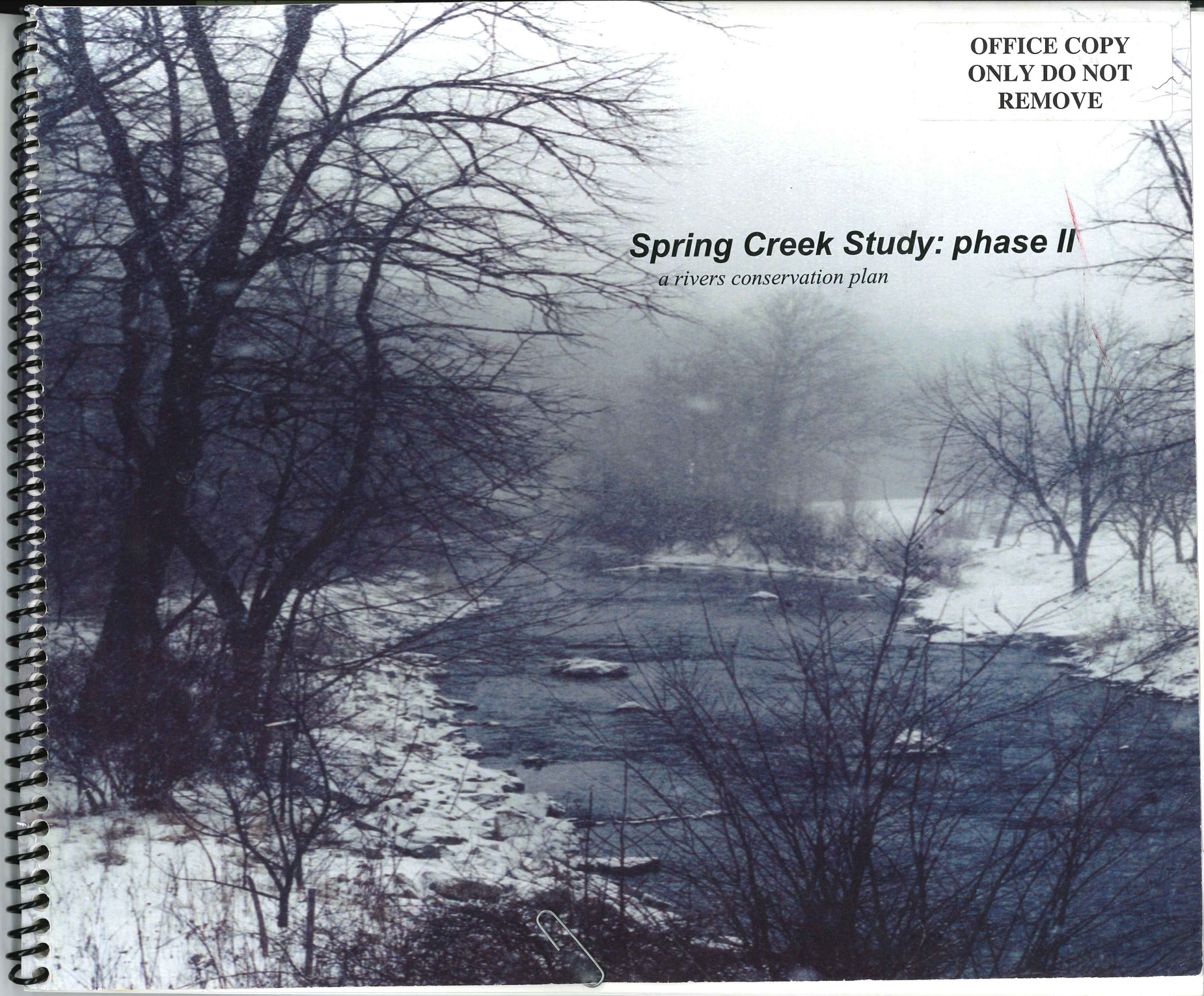
Spring Creek Study: phase II

a rivers conservation plan



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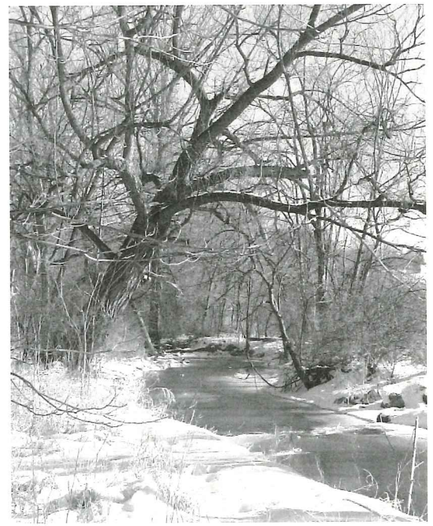


The Spring Creek Study was made possible by a Rivers Conservation Planning Grant from the Pennsylvania Department of Conservation and Natural Resources. The ClearWater Conservancy also received contributions from the Centre Region Council of Governments (including College, Ferguson, Halfmoon, Harris, and Patton Townships and the Borough of State College), Benner and Spring Townships, the Boroughs of Bellefonte and Milesburg, and the Pennsylvania State University.

The Spring Creek Study team consisted of A. Mark Battaglia, Neil P. Korostoff, and Thomas G. Yahner of the Department of Landscape Architecture at the Pennsylvania State University. Michelle Brummer, Herb Kupfer, Andrew Stine, and Leah Wasser, graduate students in Landscape Architecture and the Center for Watershed Stewardship, assisted in the project.

We would like to express our appreciation to the many individuals and organizations who contributed time and expertise to this project: Darlene Weener, Walt Ebaugh, Jennifer Shuey, Melanie Thomas, and Dave Gossage of the ClearWater Conservancy; Mike Anderson of the Land Analysis Lab at Penn State; Timothy Johnson and Zach Davis of the Department of Landscape Architecture for renderings used in public presentations and throughout this report; the Centre County Planning Commission for up-to-date G.I.S. data; the Centre County Historical Society for access to the records of the 1980 Centre County historic building inventory; and LandStudies, Inc. and Sere Ltd. for their in-kind services.

Photo credits

Aerial photographs were provided by the Public Works Engineering Office of State College. The 1958 aerial was taken by Michael Baker Jr., Inc., Rochester PA. The 1995 aerial was taken by Photogrammetric Data Services Inc., Charlotte NC.

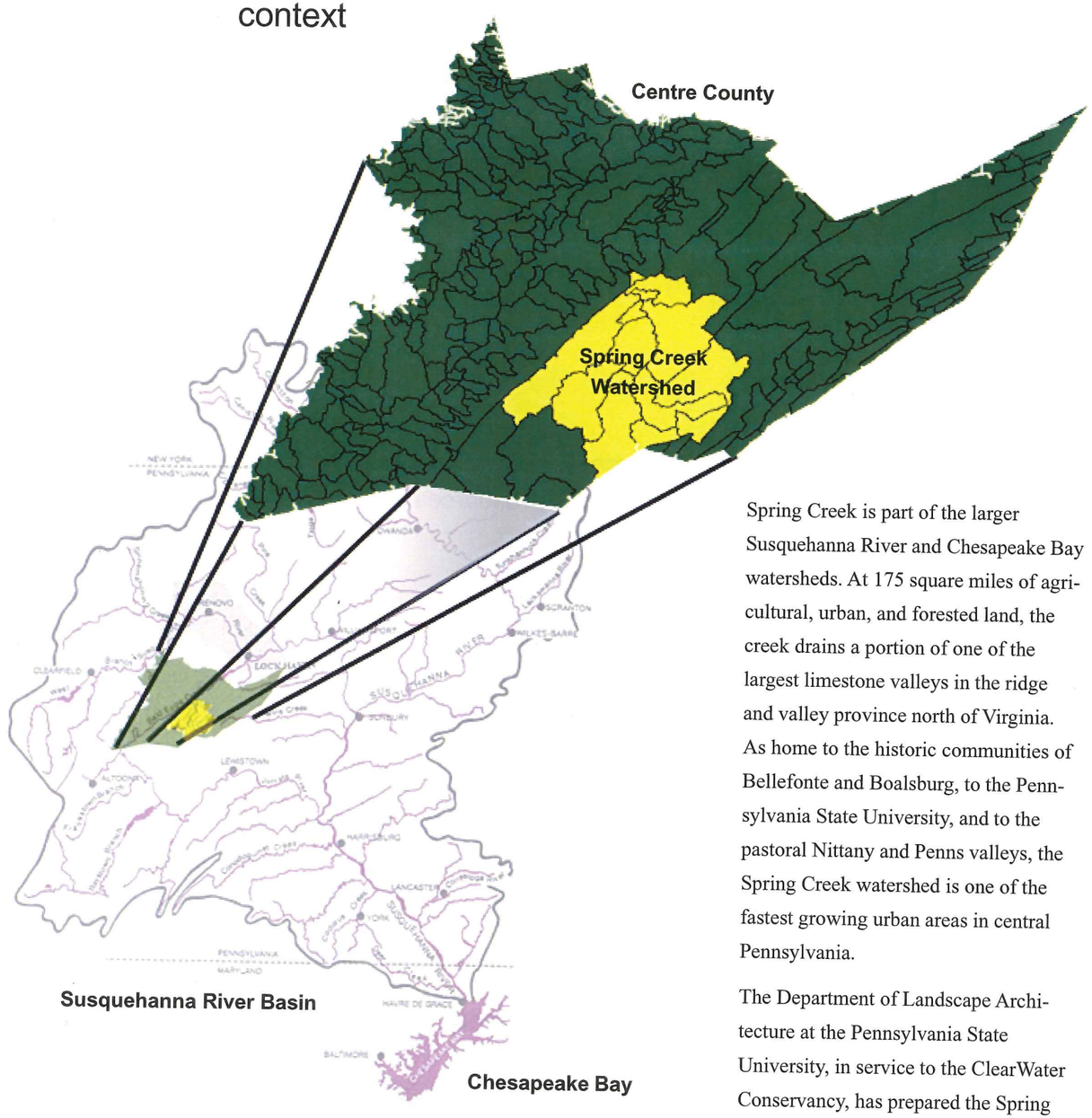
The photograph of Charles Eliot and the map of Boston were found in *Charles Eliot, Landscape Architect*, Freeport NY: Books for Libraries Press, 1971.

The photograph of J.T. Rothrock was found in *The Legacy of Penn's Woods: A History of the Pennsylvania Bureau of Forestry*, Pennsylvania Historical and Museum Commission, 1995.

Historic photographs of Scotia were provided by the Centre County Historical Society.

contents

context

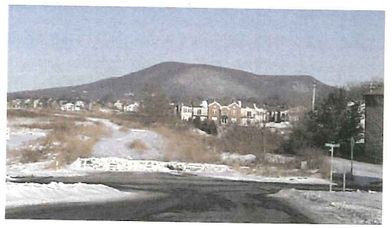


Susquehanna River Basin

Chesapeake Bay

Spring Creek is part of the larger Susquehanna River and Chesapeake Bay watersheds. At 175 square miles of agricultural, urban, and forested land, the creek drains a portion of one of the largest limestone valleys in the ridge and valley province north of Virginia. As home to the historic communities of Bellefonte and Boalsburg, to the Pennsylvania State University, and to the pastoral Nittany and Penns valleys, the Spring Creek watershed is one of the fastest growing urban areas in central Pennsylvania.

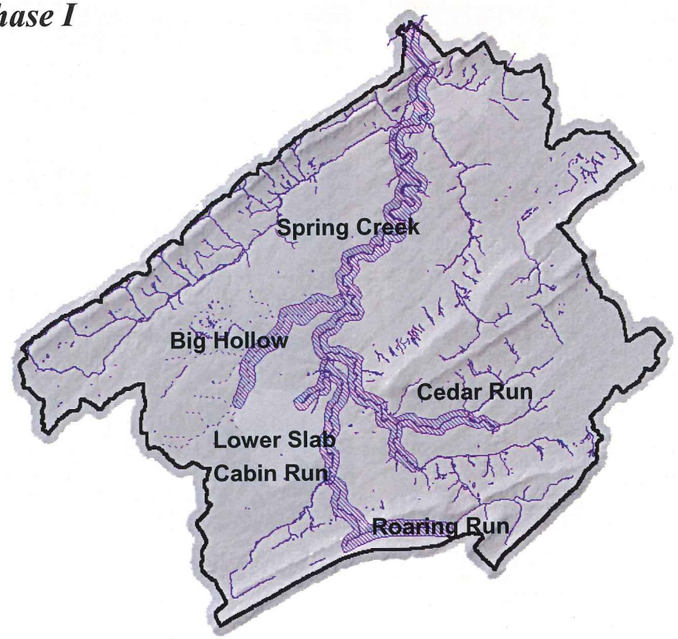
The Department of Landscape Architecture at the Pennsylvania State University, in service to the ClearWater Conservancy, has prepared the Spring Creek Study to fulfill requirements for the Rivers Conservation Registry of the



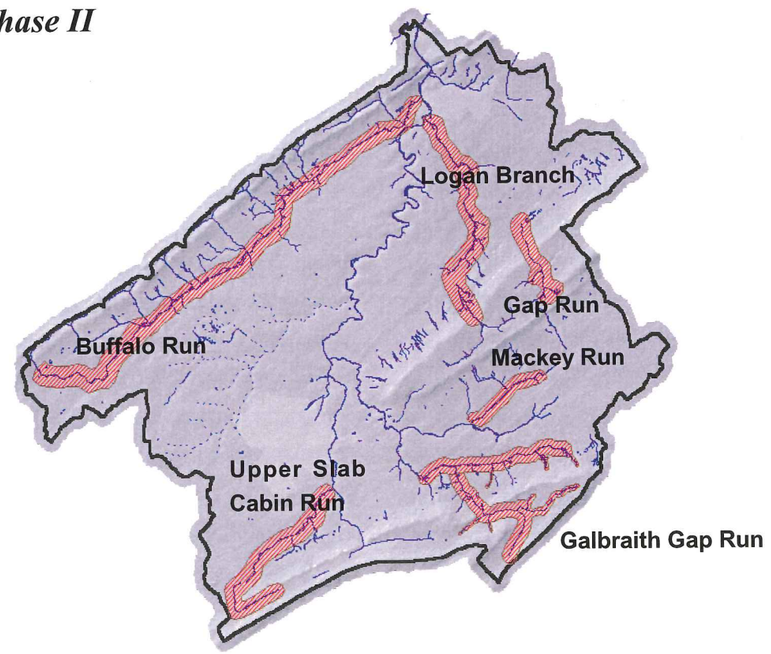
Pennsylvania Department of Conservation and Natural Resources. The intent of the study was to assess the physical resources of the stream corridor and to recommend conservation strategies for their protection. The process involved public meetings and presentations to solicit community input and participation. The product reveals the potential for these resources to enhance the well-being of the community and distinguish its identity.

The Spring Creek Study was completed in two phases. Phase I was completed in 1995 and included the main stem of Spring Creek and its Big Hollow, Cedar Run, Lower Slab Cabin Run, and Roaring Run tributaries. Phase II, the focus of this report, was completed in December 2000 and studied the remaining tributaries, namely Buffalo Run, Galbraith Gap Run, Mackey Run, Gap Run, Logan Branch, and Upper Slab Cabin Run. Phase II also compiled G.I.S. (geographic information system) data for the entire Spring Creek watershed.

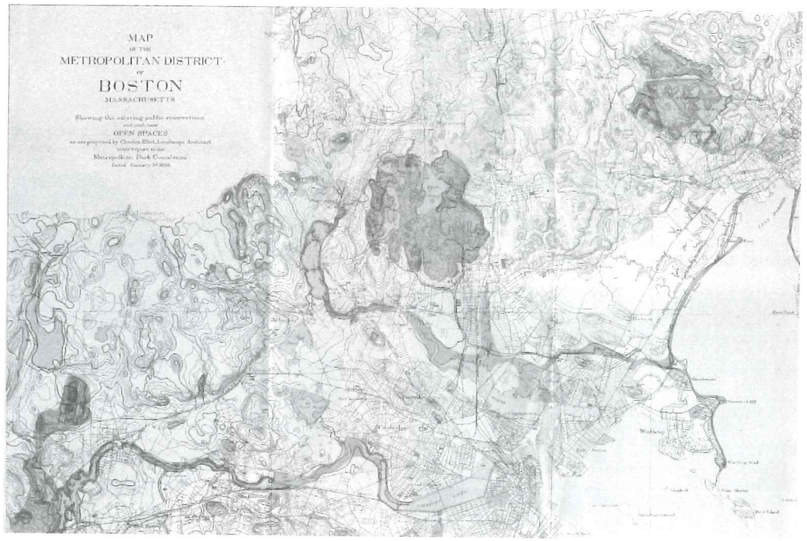
Phase I



Phase II



precedent



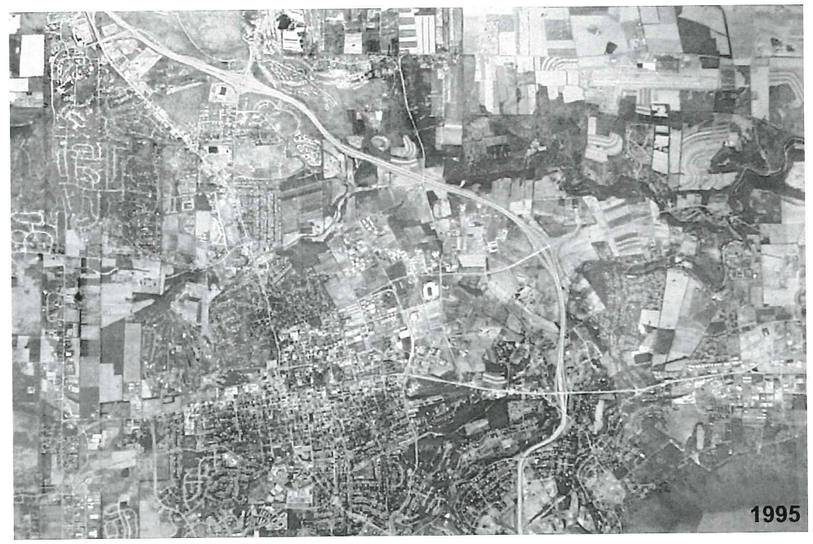
Charles Eliot, landscape architect

Dr. Joseph Trimble Rothrock, Pennsylvania's first commissioner of forestry

In his poem "The Land," Rudyard Kipling illustrates several truths about human interaction within the environment. The Earth is eternal and water is its most active agent of change. Coursing through the fabric of the landscape, water attracts and sustains life. Populations come and go from its banks and shores, leaving traces of evidence of the past. Every place has a story to tell – a network of tales of the natural and human history that have led to the present. These truths of land and water, nature and culture, endurance and change, persist in our contemporary culture and shape our response to the Spring Creek watershed.

Two individuals have inspired the recommendations made in this study. Charles Eliot, a landscape architect, proposed the Boston Park Network Plan in the early 1890s. His proposal resulted in an extensive park system based upon protected stream corridors that connect accessible open spaces throughout the region. During that same decade, Dr. Joseph Trimble Rothrock, Pennsylvania's first commissioner of forestry, initiated the purchase of public forest land to establish the Pennsylvania State Forests, the most extensive public land system in the Eastern United States.

The rapid urbanization occurring in the Spring Creek watershed today resembles, in many ways, the rapid depletion of natural resources under laissez faire government of the latter nineteenth century. Both of these men, one a designer, the other a forester, actively addressed the destruction of soil, forest, and water resources in their time. Both labored mightily to educate the public and to protect natural resources for future generations. The ideas and accomplishments of Charles Eliot and Joseph Rothrock set precedents for us as we strive to maintain a healthy and beautiful environment for the future of our community and its Spring Creek watershed.



the changing landscape

As we live, work, and play in the Spring Creek watershed, we enjoy the quality of life that this environment provides. Abundant, pure water is available for both people and wildlife, including one of the densest populations of wild trout in Eastern North America. The forested mountain ridges scenically embrace the rolling, rural, valley landscapes and frame the views of our growing metropolis. Outdoor recreational opportunities abound and the experience of nature beckons at every turn. The fertile valley soils continue to support an agricultural economy, which has been part of our region's heritage for over two centuries. Our historic towns and villages, rooted in the mines, mills, factories, forests, and waters of Spring Creek, shape our region's identity. This is the landscape of our home today, but it is ever changing under pressures of development and economy. The quality of life we find today is a result of past actions, both deliberate and unintentional. If we are to preserve or conserve this quality, we cannot take our actions lightly.

As this community continues to change and grow, its landscape is continually transformed. Particularly here in the Spring Creek watershed, urban development is rapidly altering the landscape fabric, replacing the patterns of field and forest, town and country, with that of highways, subdivisions, and shopping malls. Comparison of aerial photographs of our region from 1958 and 1995 (see above) shows the exceptional change that has occurred in the past thirty-seven years. Predictions of future growth speculate that current trends will only intensify.

As this community thrives as a center of the information age economy, there is concern that the outstanding qualities of its environment–those that make the Spring Creek watershed an attractive place to live, work, and recreate–will be threatened by that very growth. Today there is an opportunity to shape the region's growth into a sustainable vision for the future. This Rivers Conservation Plan is one of the most important efforts in articulating a vision for the Spring Creek watershed.

threads through the watershed

Watershed Recommendations

conserve and protect water resources
conserve and protect historic and cultural resources
conserve and protect scenic resources
establish and enhance recreational networks

The landscape can be seen as an intricate fabric of delicate threads. Spring Creek's landscape is woven of 350 million year old sandstone, limestone, and shale; cold streams and green forests; rolling fields and steep mountains slopes; roads, trails, and railroads; and compact towns and rural villages. These threads of nature and human activity compose our landscape and the basis of our future.

As values and resources change over time, new threads replace the old. They express new values or enhance existing ones, strengthening our sense of community and our connection with the landscape. Under pressures of growth and modernization, the fabric of our community has begun to change – for better and for worse.

As we weave new threads into our community, we should examine the landscape for patterns and qualities we desire, in order to retain and enhance them over time. Threads of streams and forests, entwined as a stream conservation corridor, can protect our sensitive waters from harmful pollutants, promote wildlife habitat, and provide an accessible experience of nature for all. Threads of local history, preserved as structures, landforms, roads, and waterways, can maintain the notable character that distinguishes our region. The scenic threads of forested mountains, cultural resource corridors, and vibrant streams can hold intact the beauty of our watershed. And finally, the thread of an outdoor recreational network can connect our towns, villages, and neighborhoods and enhance our community life. These threads will continue to strengthen the fabric of the Spring Creek watershed if we choose to conserve and protect them as we grow.

conserve and protect water resources

On the surface, Spring Creek rushes down dancing mountain tributaries, home to the native brook trout, disappearing into sinkholes in soluble limestone at the valley seam. Beneath the surface, it moves through permeable bedrock, reappearing from springs and seeps, always at 50°–55°F. It then meanders through the forests, fields, and fens of the valley en route to its union with Bald Eagle Creek and ultimate discharge to the mighty Susquehanna River and the Chesapeake Bay. As it travels through the watershed, Spring Creek and its tributaries are not only surface waters, but also groundwater resources in need of protection.

From deep beneath the surface in the porous bedrock, clean water is drawn up through wells, pumped through pipes, and ultimately delivered to our faucets. Due to the special character of our bedrock geology, much of the more than thirty inches of annual rainfall is filtered through the soil and bedrock into the aquifers below us. From here we draw water to drink, water to cook, water to bathe, and water to carry off our wastes, demanding it in large quantities.

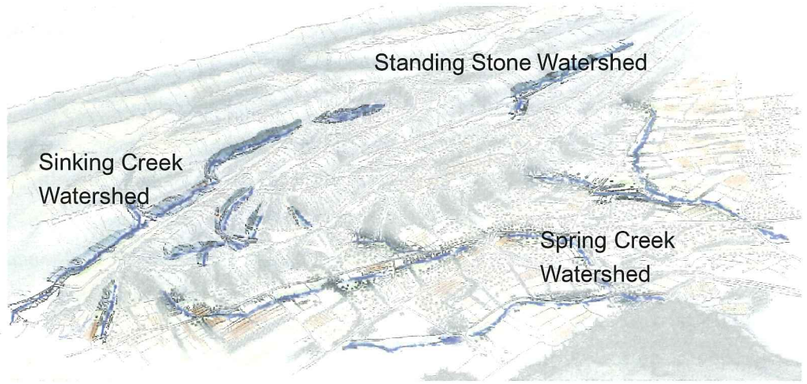
We also demand that the water we use is clean and healthful. Likewise, we expect our springs, seeps, and streams to run with clean water as they flow

through our parks and wild places where we hike, fish, and canoe. Designated as a Special Protection Water (a High Quality Cold Water Fishery) by Pennsylvania's Department of Environmental Protection in accordance with the U.S. Clean Waters Act, our expectations for Spring Creek are acknowledged and protected by law. Our quality of life depends upon these waters and the quality of the waters shows our value for life.

Protect headwaters subwatersheds

As the initial source of the groundwater we drink, headwaters subwatersheds are critical to groundwater protection. The porous sandstone bedrock of the mountain landscapes allows rainfall to soak into the surface, yielding source water, or mountain recharge, for the headwaters tributary streams. These waters, filtered through the soils and bedrock, are purified and free of dissolved solids. They emerge where impervious bedrock layers force them to the surface. As the streams flow from the mountain gaps and hillsides, they permeate the soluble strata and plunge through sinkholes deep into the valley aquifer.

Because the headwaters watersheds are predominately forested, these streams are generally free of contaminants. Water quality is protected by the buffering effects of vegetation that direct rainfall into the soil, rather than across its surface. Removal of the forest cover inevitably results in reduced water quality as bare soil surfaces erode into streams and in reduced infiltration as soils are compacted by equipment or covered with impervious surfaces. Development causes similar effects that are compounded by the addition of nutrient and chemical pollutants accumulated in runoff waters. Such changes to existing land use threaten water quality across the watershed.

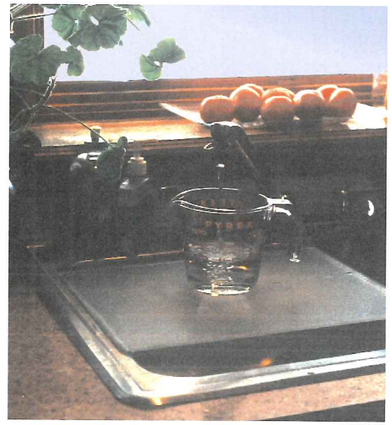


Left*: The headwaters tributaries of three watersheds originate in the Seven Mountains region.*

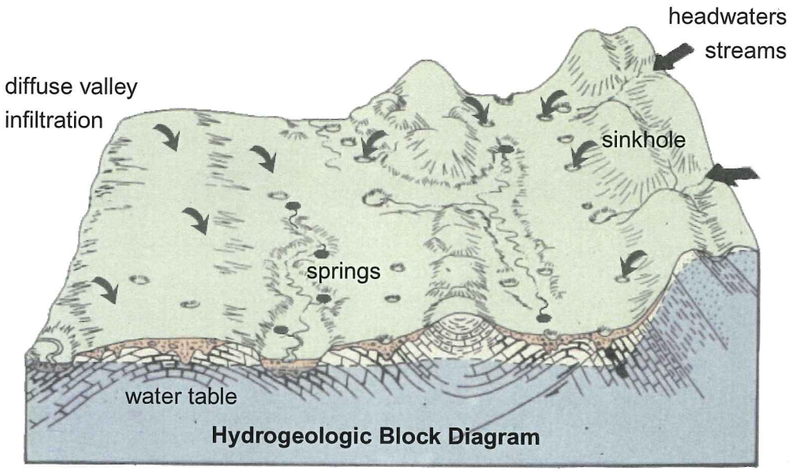
Right*: Headwaters begin as small streams in the mountain forests. As they reach the valley floor, they disappear into sinkholes in the limestone bedrock. Streams reemerge as valley springs and meander through fields and young woodlands on their way to Spring Creek's main stem.*

Left: *Forested mountain landscapes are vital to protecting the waters that fill the aquifer from which we draw our daily water supply.*

Right: *Headwaters streams emerge from mountain gaps and dissolve soluble bedrock at the mountain base. These voids in the bedrock (sinkholes) permit stream water to directly enter the water table. While the valley floor filters rainwater in undeveloped areas, contaminated runoff from impervious surfaces is directed to the water table by streams and sinkholes.*



To ensure that the valley aquifer is constantly replenished and will continue to pour clean water into our valley streams, we must conserve the land and water resources in the headwaters subwatersheds. It is essential for the community to develop partnerships with both public and private land owners on Bald Eagle Ridge, Mount Nittany, and Tussey Mountain to develop water resource protection policies that respect land owner rights and protect public health.

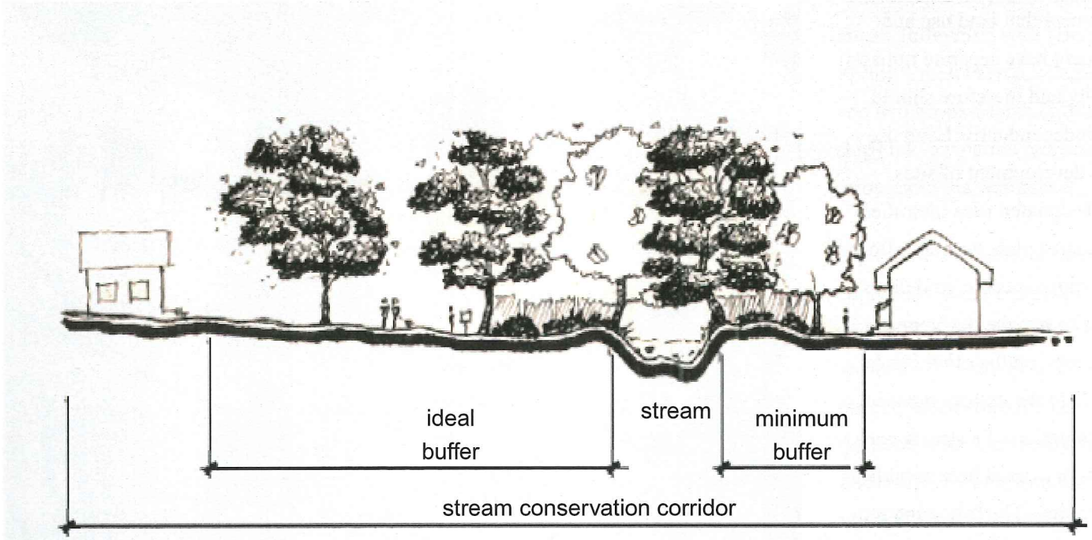


Recharge ↘ *and discharge* ↗ *across the landscape*

Protect groundwater recharge areas

Over millions of years, the continued infiltration of rainfall through the soil has dissolved an extensive network of channels and voids within the limestone bedrock underlying the watershed. The water held within this vast network, a series of aquifers, is in effect an enormous reservoir beneath our community. Throughout the valley, water is either flowing into (recharge) or out of (discharge) this aquifer. As discharge only occurs at the springs along Spring Creek and its tributaries, the entire remainder of the watershed performs the function of aquifer recharge, soaking stormwater into this underground reservoir.

But today, not all water soaks into the soil. Buildings, roads, and even turfgrass and agricultural areas with compacted soils decrease infiltration and recharge and increase the amount of stormwater that drains directly into our streams. This increased stormwater runoff carries with it sediments, nutrients from farm fields and pastures, oil and other contaminants from paved surfaces, and fertilizer and pesticides from lawns. Rather than being slowly infiltrated and cleansed through the soil, these pollutants are washed directly into Spring Creek, reducing the amount of precipitation available to replenish the aquifers. As a result, the quality of both ground and surface waters is compromised, impacting human health and environmental quality. Therefore, maintaining the integrity of the groundwater recharge process is fundamental to the conservation of Spring Creek.



Stream Conservation Corridor and Riparian Buffer

The stream conservation corridor uses a setback to protect both ecological and cultural resources that can be found or developed along the stream.

Establish a stream conservation corridor

A stream conservation corridor would protect in-stream and streamside resources, both cultural and ecological. This recommendation is broader than the previously proposed Riparian Conservation Zone. It has been recognized that the stream corridor includes more than just the ecological resources that "riparian conservation" might imply. In light of the cultural values the stream may possess–its historic, recreational, and scenic resources–the more general phrase, "stream conservation corridor," was chosen.

Historically, development was sited near the stream–even on the stream–where water was accessible for drinking, transportation, and industrial uses. Today, as a result of technological advances, such as mechanical wells and water and sewer infrastructure, our development patterns are no longer tied to these streamside or riparian areas. Though agriculture still relies on surface waters for pasturing, we have the ability and responsibility to build residences, commerical complexes, roadways, and other structures away from sensitive natural areas.

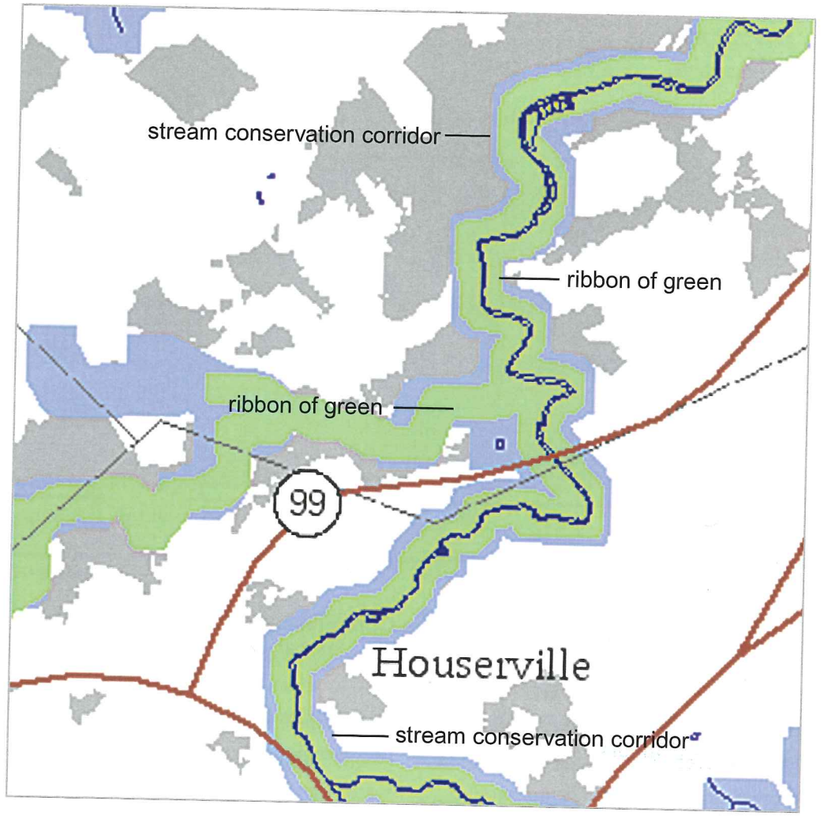
These types of development have a number of significant negative impacts on the water quality of our streams. The most important to note is the discharge of increased runoff and non-point source pollution directly to the stream. Even though development outside the stream conservation corridor will also increase runoff and non-point source pollution, setting new construction away from the stream would allow for natural absorption and filtration of stormwater. Consequently, streams would receive cleaner discharge, protecting water quality and aquatic habitats.

The stream conservation corridor would set new development away from the stream, allowing space for vital riparian functions and conserving scenic, historic, and recreational linkages. Within this corridor, a "ribbon of green," a continuous riparian forest buffer, would become a visible thread through the watershed.

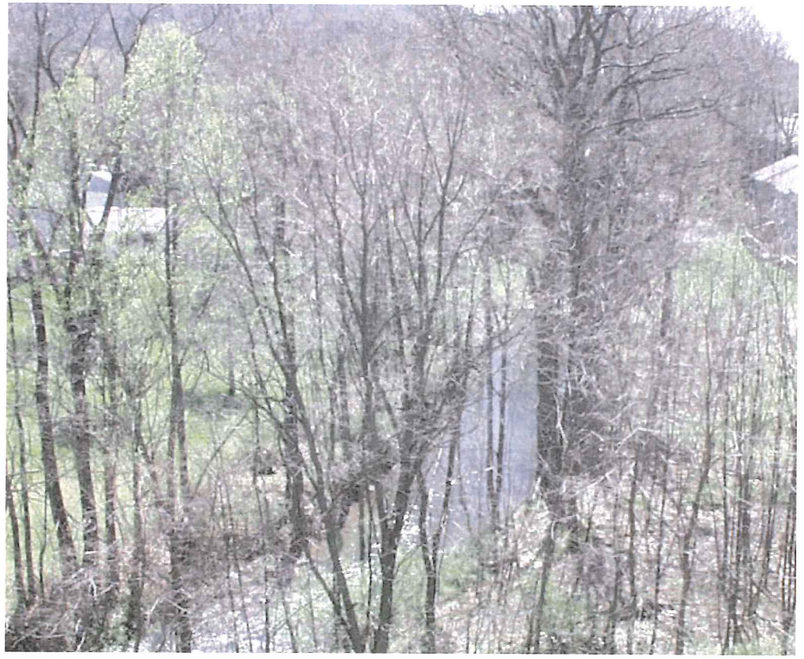
Within the discussion of development, we must recognize that land use and land management have separate impacts on water quality and therefore should be addressed independently. Land use allows for the development of sites according to designated uses identified in a comprehensive plan; zoning follows this plan with more specific guidelines as to how the site may be developed. Land management, on the other hand, typically relates to the management of vegetation. The notion of a stream conservation corridor is used here to address land use and zoning. The following recommendation for riparian forest buffers addresses land management.

A stream conservation corridor that limits development does not intend to imply that land parcels adjacent to the stream cannot be developed. More accurately, it limits the suitable development site to areas outside the corridor by way of a setback in order to allow natural stream functions to occur. The corridor would acknowledge the interactive relationship between land and water in the protection of water quality throughout the Spring Creek watershed.

The establishment of a stream conservation corridor, enacted as a zoning overlay district by our municipal governments, would enable land use planning



decisions commensurate with the importance of the stream corridor landscapes for water quality protection. It could also promote the establishment and protection of riparian buffers, sensitive habitat areas, historic landscapes, and scenic corridors. Furthermore, it encourages the use of "best management practices" for agricultural and forestry activities within the conservation zone and spurs urban and suburban landscape management to set and achieve the goal of no net impact on water quality. Two municipalities in the Spring Creek watershed have already created stream corridor overlay districts within their planning codes. Adoption of a stream conservation corridor, with appropriate standards, should be a priority for all local governments within the watershed.



Create "a ribbon of green" – riparian forest buffers

The first European settlers to the Spring Creek watershed encountered a landscape clothed in a thick green forest. The forest absorbed, filtered, and infiltrated rainwater, enhancing the quality of the water entering surface waters and subsurface aquifers. Leafy branches shielded the stream from the sun, maintaining the cool temperatures necessary for indigenous species. Woody roots held streambanks in place. The leaves and branches that fell into the stream created a food chain and diverse aquatic habitats. But as early settlers removed the natural streamside forests, these functions were impaired or eliminated.

For their role in water quality, riparian forest buffers should be protected and restored to create a continuous "ribbon of green" along Spring Creek and its tributaries. The "ribbon of green" would protect our waters for drinking, recreation, and wildlife by increasing stormwater infiltration, removing nutrients and other contaminants, retaining sediments, enhancing natural habitats, and moderating stream temperatures. A continuous buffer would connect existing streamside parks, including the Milesburg Community Park (Milesburg), Talleyrand Park (Bellefonte), Spring Creek Park (College Township) and Millbrook Marsh (College Township) into a riparian recreational network throughout the watershed.

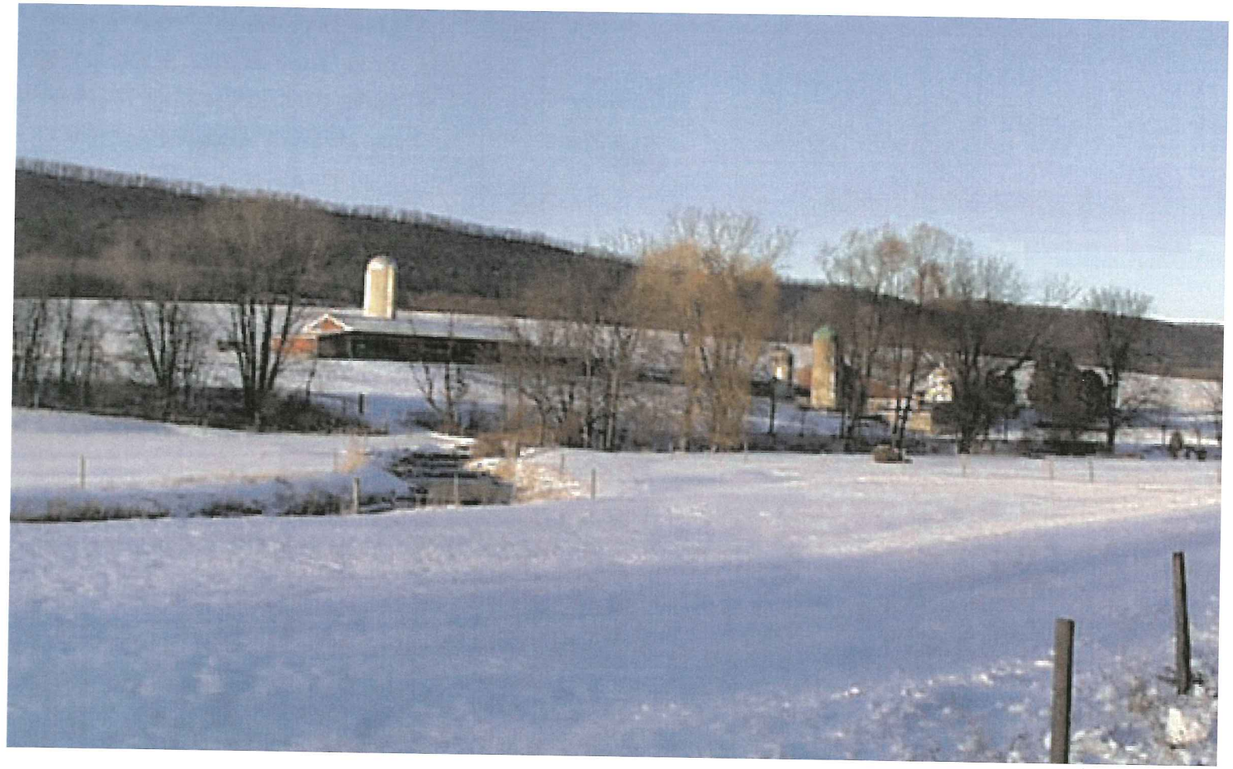
Riparian forest buffers would also contribute to our community identity and the beauty of the stream in all seasons. They might be compared to the cherished American elm allées on the Penn State University Park campus. These allées were planted many years ago and are still valued and cared for today. Spring Creek's riparian forest, "a ribbon of green," would become

the community's grand allée. It would be a symbol of the community's affection for its environment and a functioning resource for nature and people alike. Though it may take a hundred years to realize this vision of majestic trees lining our streams, that future begins with the decision to protect and promote riparian forests today.

More detailed information and bibliographic citations regarding riparian buffers can be found in appendix a.

conserve and protect

historic and cultural resoucres



Humans have long shaped their environment by manipulating and interacting with the landscapes provided by nature. Historically, human activities have been particularly intensive along waterways because of their usefulness for security, sustenance, power, transportation, and waste removal. The history of civilization is tied to the practical and strategic use of water, but art and literature provide us with abundant evidence that humans also find the pleasures of waters both inspiring and satisfying.

Prior to European settlement, Native Americans lived and hunted along Spring Creek and its tributaries for nearly 10,000 years. Evidence of their habitation has been unearthed in the Spring Creek and nearby watersheds. More recently, in the late 18th century, agriculture and industrial development emerged when this watershed was the edge of the American frontier. The agricultural character established in the 1790s remains visible today in the form of houses, barns, hedgerows, and field patterns. Remnants of early industry–gristmills and millraces, iron furnaces, ore banks, and charcoal hearths–can still be seen throughout the community. Towns and villages are further reminders of life in the pre-automobile era. Much of this history was tied directly to water, solidly connecting our past to our concerns for Spring Creek and its tributaries. In order to conserve, protect, and promote the history of our community, these traces of history that still exist in our watershed should be acknowledged and celebrated.

The elements of our industrial heritage–iron ore pits, millpower dams, and charcoal hearths–are scattered throughout the mountains, valleys, and stream corridors of Spring Creek.

Acknowledge and inventory evidence of our past

The first step toward conserving artifacts of our local heritage is to acknowledge their presence in our landscape and to develop a thorough inventory of their location, characteristics, and cultural value so that they may remain a living part of the community.

Remnants of our industrial heritage are usually subtle and often overlooked–easily erased from the landscape or allowed to fade away in neglect. While the Centre Furnace stack and iron master's mansion are well preserved and interpreted, much of what remains of the charcoal iron industry is virtually hidden from view. Benner's Forge on Spring Creek, the iron ore pits scattered throughout the valley, and the charcoal hearths in Shingletown Gap all offer opportunities for revealing that era of the community's history, but they require interpretation or enhancement to be meaningful. In addition, evidence of lumbering, railroads, quarries, mills, and dams is sprinkled in fading, but still discernable, patterns across the watershed.

Over two hundred years of intensive agriculture have also shaped the character of our landscape. Hedgerows, stonewalls, farmhouses, and bank barns mark the location of past and present agricultural activities. Although its presence is still strong, the agricultural landscape is under tremendous pressure to modernize or urbanize. Farming practices are changing, and agricultural land is rapidly becoming residential and commercial suburbia. Agricultural fields are now bisected by highways and sprouted with housing subdivisions. Commercial zones spill out along roadways, blurring the distinction between town and country. These changes are dramatically transforming the character of the landscape and threaten to obliterate this important part of the region's history.

Our towns and villages are unique and contribute to the particular character of the watershed. While several have been designated and protected as part of our state or national heritage, many more are telling of our local history. Our historic

Historic farmhouses, hand-built stonewalls, and majestic silos are functional and aesthetic components of Pennsylvania's farmstead architecture.

The villages of Axemann, Pine Grove Mills, and Coleville were centers of commerce and social life for area farmers, factorymen, quarry workers, and their families.

settlements range in size from the crossroads village of Fillmore to the county seat of Victorian Bellefonte. These settlements represent a historic pattern of building: a mix of residential and commercial buildings, constructed close to one another and to the street. These tightly configured, pedestrian-scale centers contrast dramatically with contemporary developments. Beyond these centers, there is also an extensive roster of historic rural structures scattered throughout the watershed.

Remnants of the historic transportation network that connected these landscapes can be found throughout our watershed. Walls of the navigation canal between Milesburg and Bellefonte, active and abandoned railways, and a network of roads from the pre-automobile era indicate the routes and modes of transportation used by earlier Spring Creek residents. These remnants reveal historic patterns of settlement and industry throughout the watershed landscape.

The only way to ensure that the past remains visible to future generations of watershed residents is to acknowledge the importance of these artifacts and to include them in a community inventory or database of historic resources. Such a database would serve as a record of the landscape and a tool for telling the stories of our local history, for the story-telling or sharing of our past is the true celebration of our heritage.

Historic transportation by rail, road, or stream engaged travelers in intimate contact with the form, texture, and pattern of the landform around them.

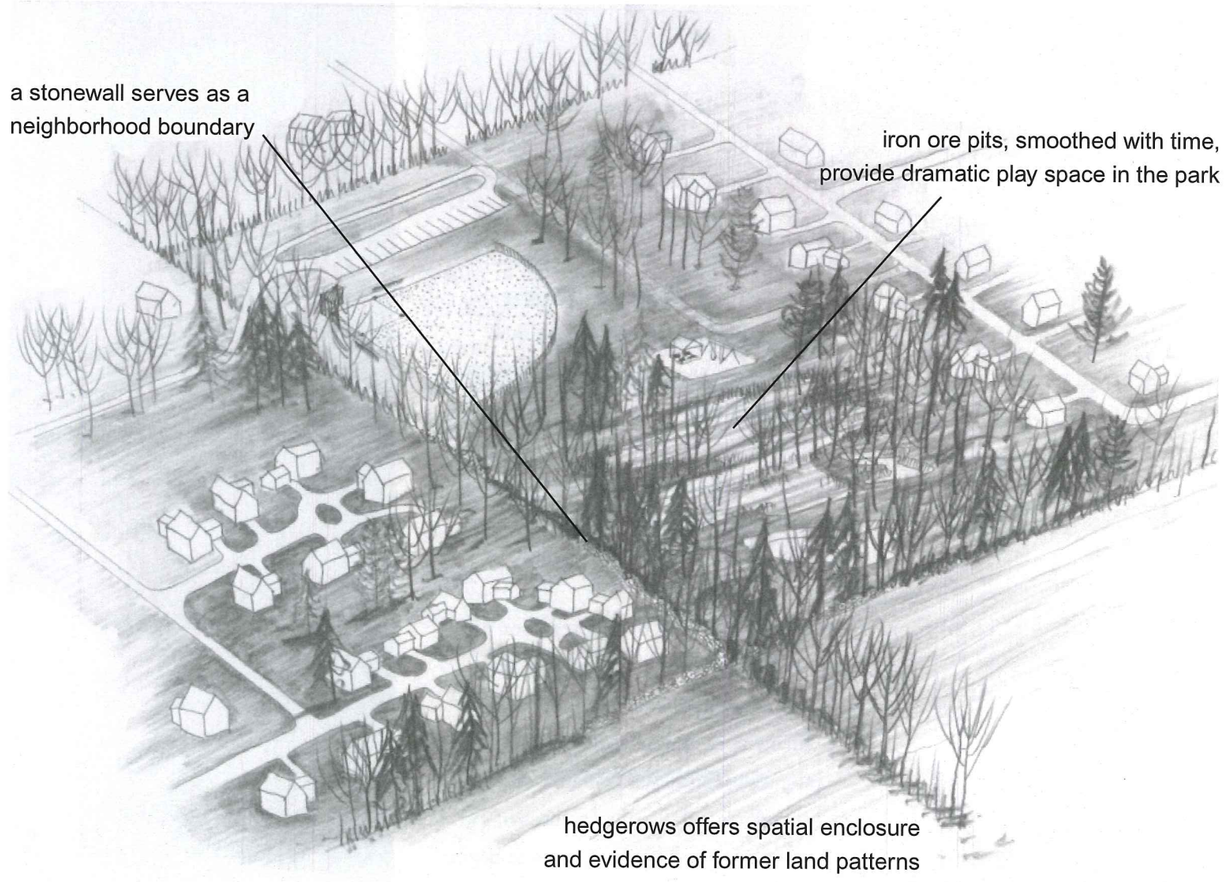
Develop with history

Instead of discarding historic artifacts, we can incorporate them into the community as it changes and develops. Once identified and valued, existing hedgerows, stonewalls, and iron ore pits can be integrated with future parks and greenways as landmarks that reveal the community's heritage. Old farm hedgerows in residential subdivisions could serve as recreational networks for neighborhoods and as visual reminders of past land use. Commercial or office development could overlook an abandoned quarry, engaging the landscape as a scenic backdrop to daily business. When we develop with history, we can preserve the past and look to the future in a way that contributes to the unique character of the Spring Creek watershed.

We must recognize that we are writing a new history into the landscape every day. With each land use and development decision, we are impacting the character of our community. Too often we undervalue the existing vegetation, unaware of what it tells us about past culture or its ecological value for buffering development impacts. Whether the history we write today recognizes and builds upon the past or turns its back on evidence of the past depends on how creatively historic resources are integrated with the changing community.

Hedgerows in Tudek Memorial Park accentuate the recreational experience, revealing patterns of former land use in this residential neighborhood.

Remnants of an industrial and agricultural past can be incorporated into residential and park development.



conserve and protect
scenic resources

The beauty of the Spring Creek watershed is admired and appreciated by visitors and residents alike. Its scenic beauty is one of the region's most important assets, setting the mood for the lifestyles of local residents. The rolling mountains and broad agricultural valleys suggest a rural pace to daily life. Even when that suggestion goes unheeded and our lives become hectic and overburdened, the natural and cultural resources of our local landscape provide an underlying sense of peace.

Our scenic resources exist at two scales. At the site scale, they include historic and cultural artifacts, subtle topography, diverse and seasonal vegetation, and wildlife and water in ponds, streams, and wetlands. At the landscape scale, they include larger patterns of land development, natural and manipulated landforms, and vegetation, particularly as habitat. While both scales are influenced by private ownership, the scenic qualities they posses are nonetheless viewed and valued by the public.

We must express our appreciation of our scenic resources to land owners and managers and commit our support, financial or otherwise, to their preservation. The forested mountains, streamside corridors, and visual awareness of the stream network are key places to begin.

The forested landscapes of Bald Eagle Ridge, Mount Nittany, and Tussey Mountain provide a scenic backdrop to our daily lives.

Conserve forested mountain slopes

To many, the primary image of the Spring Creek watershed is a snapshot that includes the bustling town of State College, the University Park campus, and the rolling valley landscapes all embraced and framed by the steep, verdant mountain slopes that surround the community and backdrop the valley scene. These forested mountain slopes are among the most important scenic resources of the watershed. They enclose the valley, place the town in the embrace of nature, and provide a feeling of subtle security within the landscape.

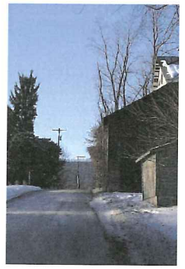
Few residents of the Spring Creek watershed realize that the ever-visible, forested mountain slopes are largely in private ownership. For the most part, Pennsylvania State Forests do not begin at the base of the first mountain, but rather near its ridge extending into the mountainous terrain. Private land owners, under Pennsylvania law, have great latitude in the management (and disposal) of their forest resources, even those of such scenic significance as Tussey Mountain and Bald Eagle Ridge. Residential development and clear-cutting are the most obvious threats, but even minimal changes in land use or land management have potential impacts beyond the site.

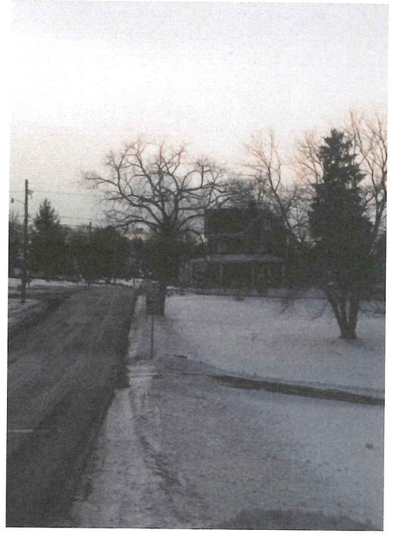
While some degree of development or harvest will likely occur, conservation practices can help to preserve the scenic quality of the forested mountains. Careful siting of structures with minimal clearing can preserve the valley view of the ridgeline and maintain the contiguous forest for wildlife. Selective timber harvest can sustain the native seed source for future forests, maintain forest structure, and improve timber quality. These and other stewardship practices can help conserve the forested mountains for present and future generations.

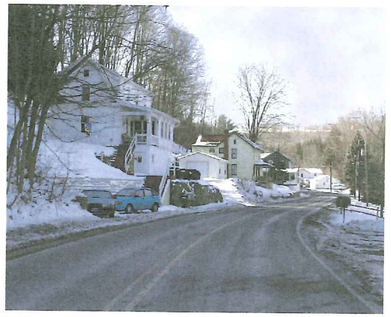
Protect scenic travel corridors

Scenic quality plays a significant role in the choice and enjoyment of recreational activities, but it contributes equally to our everyday lives as we move about the watershed. Our travel corridors integrate our community, connecting us with the places where we live, work, and play. Though under-recognized as a factor in local quality of life, the specific scenic quality of our corridors deserves conscious awareness and conservation.

Since so much travel today is via automobile, particular attention should be given to the protection of our scenic byways such as PA Route 550 along Buffalo Run, PA Route 144 along Logan Branch, and Brush Valley Road along Mackey Run. These eighteenth and nineteenth century dirt roads, now paved with blacktop, provide a more intimate experience of the historic and natural landscapes than do contemporary highways. These routes direct our views to historic artifacts and older patterns of settlement. In addition to these visual resources, tight turns, minimal setbacks, and constrained views allow the traveler to experience the texture and scale of the landform and other details of the historic landscape. Such corridors are increasingly rare and should be valued as resources for the future, not simply as anachronisms in need of adjustment.







Historic architecture, sinuous road alignment, and proximity to structures and streams express some of the scenic qualities of our local routes.

Though water has always played a primary role in the physical development of the watershed, many of us are unaware of its ongoing presence and functions. New signange could help residents identify their local streams and call attention to their sensitive condition.

Enhance visual awareness of Spring Creek and tributaries

Our local stream network has sculpted our valley and facilitated transportation over hundreds of years, yet at present, there is little awareness or acknowledgement of Spring Creek in our community. Thousands of local residents travel daily across roadway bridges, barely aware of the stream and its tributaries. There are no signs to identify these crossings of Spring Creek, no attempt to provide a brief glimpse of sunlight dancing on the water or of ancient willows and massive sycamores hanging ponderously over the stream. The infrastructures of water supply and wastewater treatment, both intimately connected with the stream, are hidden from public view. Even the essential life-giving function of stormwater, the return of water from the heavens to recharge our needs on earth, is interrupted by paving and concealed in catch basins, pipes, and culverts.

Public awareness and enjoyment of Spring Creek could be enhanced by conscious views to the stream and its environs. Simple signage in key locations could bring the waters of Spring Creek to the visual attention of community residents in their daily routines. One place to begin is the roadway crossings of the stream, where the name of each tributary could be clearly marked. Another strategic site is the curb above streetside catch basins, where "Spring Creek Watershed" could be stenciled as a reminder of the hydrologic network to anyone contemplating disposal of used motor oil or other contaminants. In addition to these textual reminders of the stream, fountains could celebrate the significance of water in the public spaces of our community. Regardless of proximity to the stream, water in its many forms can foster a sense of community and stewardship among Spring Creek residents.

establish and enhance

recreational networks

Outdoor recreation has become a requirement for modern health and well-being. It has evolved from being the labor of the poor to the play of the rich and is now perceived as key to a high quality of contemporary personal and community life for all. Today, easy access to a broad range of outdoor recreational activities is considered fundamental to a region trying to attract new businesses and residents.

The Spring Creek watershed provides wonderful opportunities for a tremendous range of outdoor recreation activities from walking to biking and boating, from wildlife observation to hunting and camping. As the region's population grows, so will demand for these activities. Existing opportunities should be preserved, new ones created, and their collective value greatly enhanced by their integration into a comprehensive recreational network.

Outdoor recreational activity moves people through the landscape by several means – on foot, by bicycle, or by boat or canoe. As they move, people interact with the environment, both physically and psychologically. Relaxed from the daily routine, self-reflection, scenic beauty, and play can be truly appreciated.

Upper left*: Opportunities for hiking surround us and could be networked for backpacking in the local community.*

Lower left*: Spring Creek offers limited opportunity for boating, but nearby Whipple Dam and Bald Eagle State Parks provide for a variety of water-based activites.*

Right*: From the headwaters to the mouth, fishing is a favorite recreational activity of residents and visitors alike.*

Establish new destinations

The thread of recreation moves us into and through the landscape. We have numerous recreational destinations already within the Spring Creek watershed–state forests, municipal parks, museums, and historic districts, to name a few. Each one provides a unique setting for our recreational needs. State forests offer destinations for nature-based activities. Municipal parks provide facilities for athletics. Museums and historic districts illustrate the stories and settings of locally significant people, events, and achievements. In addition to meeting individual needs, these sites offer locations for social and cultural celebrations as well.

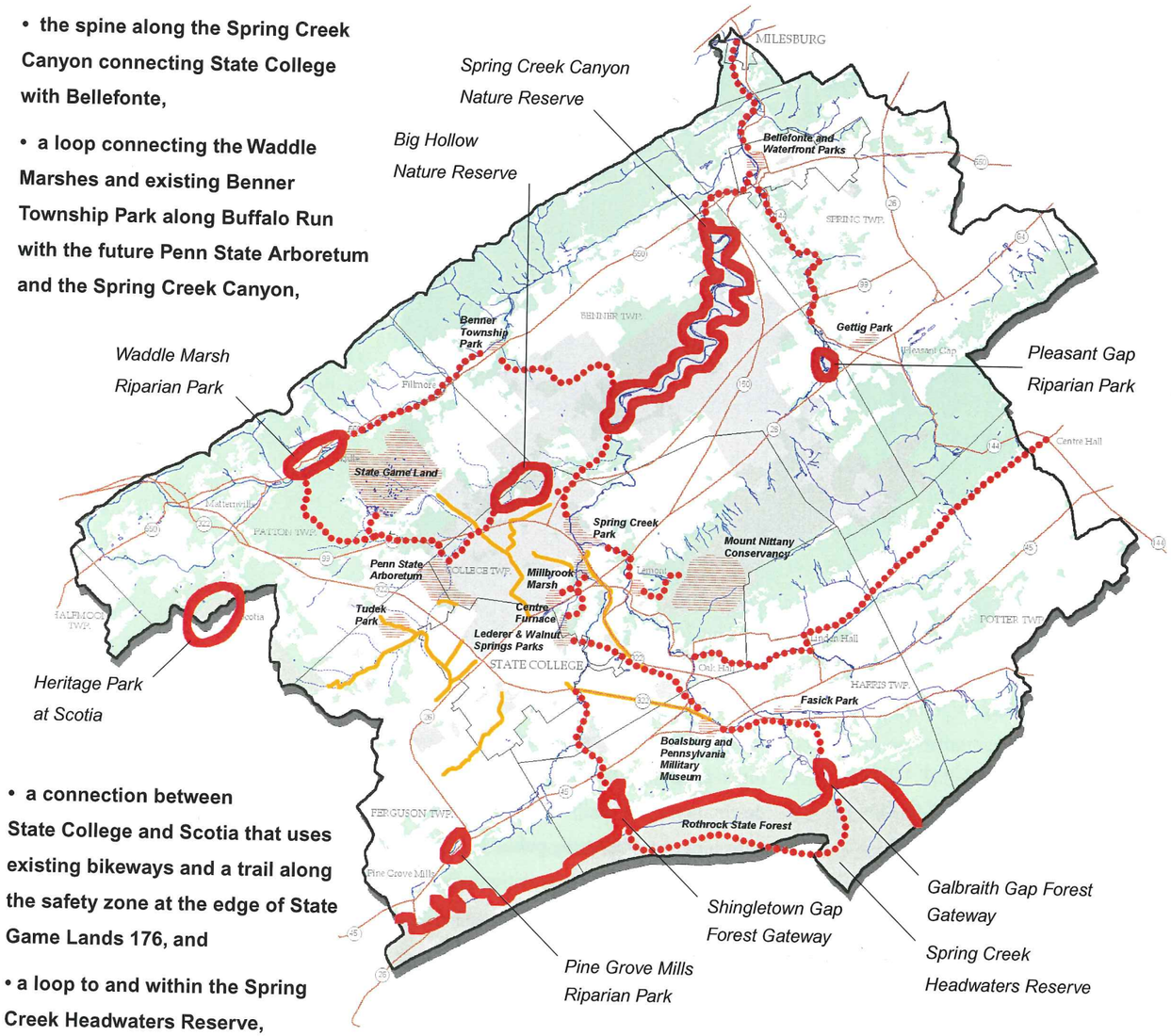
While our recreational sites have served us to date, they are insufficient in light of current growth trends. We must expand our recreational resources, particularly in the rural areas where residential growth is rapidly occurring, in order to provide an environment of complete well-being.

Phase I of the Spring Creek Study recommended several new destinations along the main stem, including a Bellefonte Historic Waterfront District, Millbrook Marsh Nature Center, and Rothrock State Forest Recreational Gateways, among others. We are pleased to acknowledge that the Nature Center has been established and recommendation sites have received increased consideration over the past five years.

Following this precedent of streamside parks and cultural landscapes, Phase II recommendations propose new recreational sites along the peripheral tributaries. A Spring Creek Headwaters Reserve, riparian parks at Waddle and in Pine Grove Mills and Pleasant Gap, and an iron mining heritage park would expand and protect recreational opportunities for Spring Creek residents. New destinations will undoubtedly require enhancement of existing public land holdings or new land acquisitions. We should examine the availability and accessibility of its public lands and open space for recreational use by the watershed community.

Four key recreational connections emerge from the network of Phase I and II proposals:

- **the spine along the Spring Creek Canyon connecting State College with Bellefonte,**
- **a loop connecting the Waddle Marshes and existing Benner Township Park along Buffalo Run with the future Penn State Arboretum and the Spring Creek Canyon,**

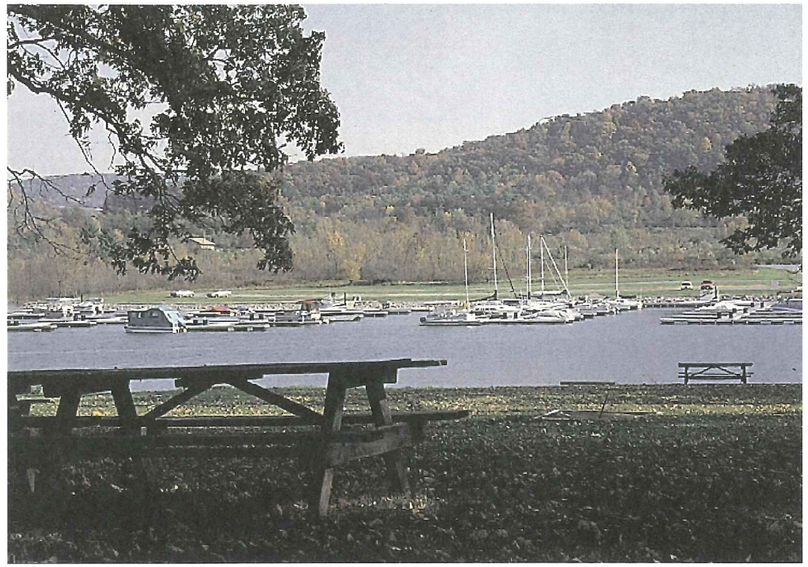


- **a connection between State College and Scotia that uses existing bikeways and a trail along the safety zone at the edge of State Game Lands 176, and**
- **a loop to and within the Spring Creek Headwaters Reserve, connecting the two Forest Gateways.**

Enhance recreational connections

Travelling to destinations can also be a part of recreation. Our time away begins when we leave our homes and ends when we return. Some of our current destinations are already networked by way of pedestrian trails, bike paths, and even public transit. (Indeed for some, arriving by bike or on foot further enhances the sense of "getting away" from modernization and fast-paced technology.) But other sites are accessible only to motor vehicles.

The communities along Logan Branch and Buffalo and Slab Cabin Runs are undoubtedly connected with the rest of the watershed by roads, but they could be further integrated by designated footpaths and bikeways. These connections would make the parks, schoolyards, and other recreational sites of these tributaries more accessible to residents living near the central spine. In addition, pedestrian and bike paths can be made along these stream corridors and throughout these developing rural communities to link local residents with each other and their common landscape. Through a cooperative effort, we can create a truly cohesive recreational network across the watershed.



Upper*: Our local recreational network could extend beyond the watershed boundary to connect us with additional opportunities at Bald Eagle State Park.*

Lower*: Rothrock State Forest offers a variety of recreational experiences and destinations, such as Bear Meadows Natural Area.*

Network beyond the watershed

The recreational system could extend beyond the watershed boundary as well, reaching downstream communities and destinations, and those over the headwaters divide. Downstream connections could lead one to the stories of Bald Eagle Creek and CurtinVillage. Through the Headwaters Reserve, residents could reach not only designated natural areas, such as Bear Meadows, Detweiler Run, and Alan Seeger, but also the Mid-State Trail and many state parks. This expanded system could open our range of activity, education, and interpretation and connect us to the regional landscape.

weaving new threads into our community resources

Site Recommendations

spring creek headwaters reserve

riparian parks

scenic corridors

heritage park at scotia

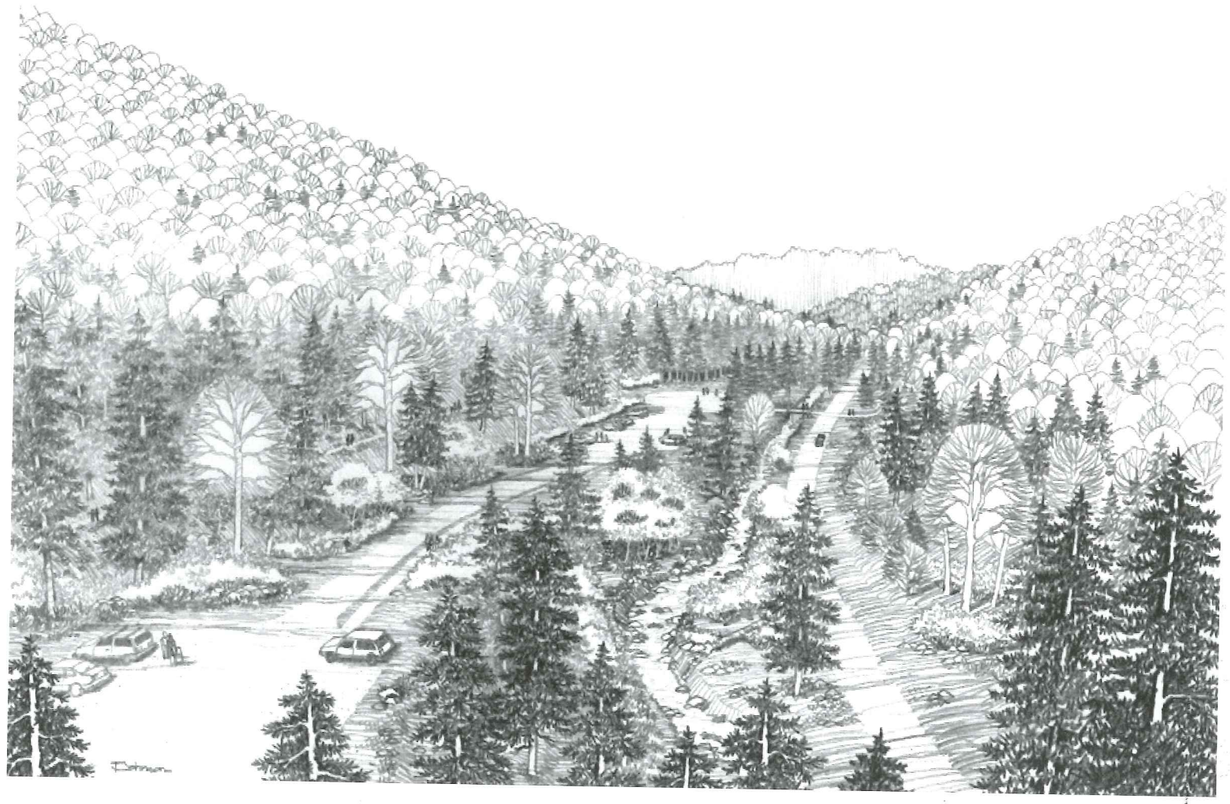
While we may agree with the goals of conservation, we often do not know where to begin. The objectives span many public and private interests and the tasks seem daunting in the face of American individualism. Yet our common interests in the quality of life and our water calls us to action.

The projects that follow address our natural and cultural resources, specifically those along the peripheral tributaries of Spring Creek, that are wearing thin as a result of rapid growth and modernization. The resources at each site are viable and valuable but are in need of active consideration for their function and meaning to persist. By engaging them in the ongoing development of our community, we acknowledge their presence and influence in our lives.

Seeing the threads of our resources as opportunities to enhance our community fabric is the first step toward conservation. Once identified, they can be evaluated and integrated along with our development needs. Our natural and cultural resources need not be discarded in the creation of new places, but instead can inspire them. We often find that the overlap of resources–streams with historic settlements, scenery with recreation–leads to the increased significance of a place. These places are indeed the vibrant sites, where people of various interests come together as a community to enjoy their watershed.

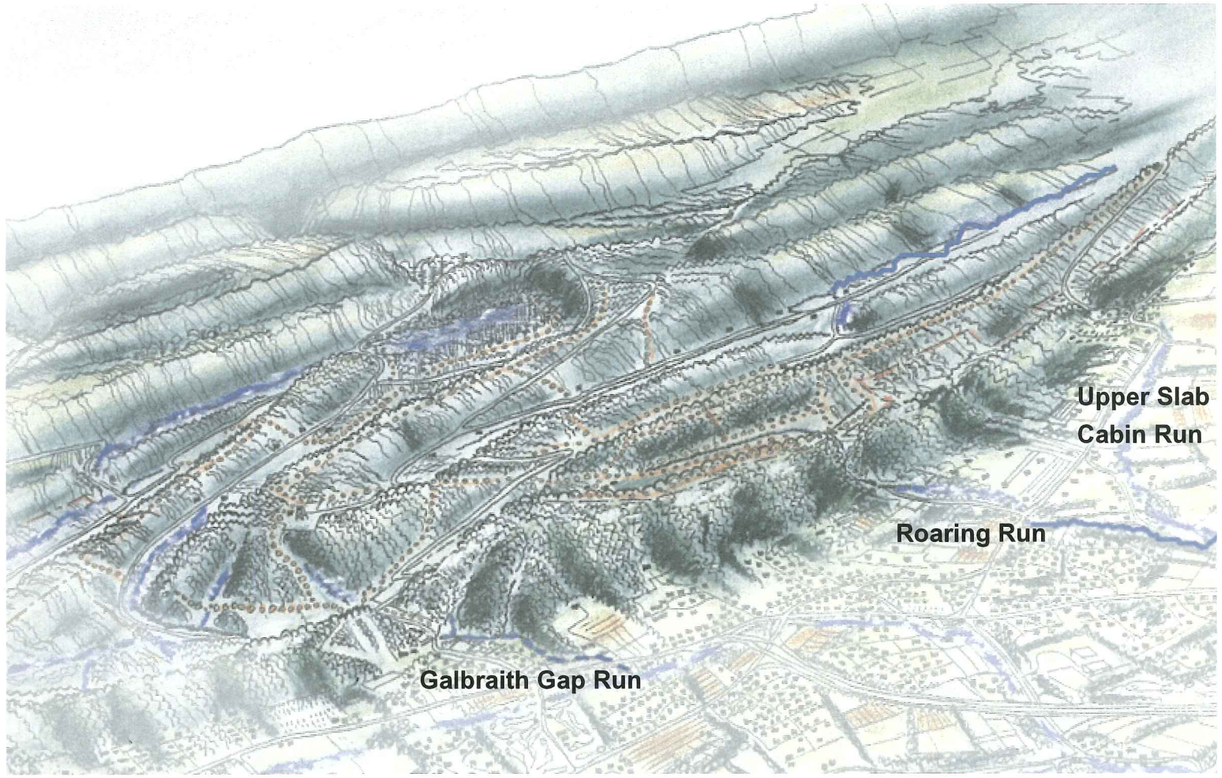
The following projects begin to show how meaningful places can be created and threaded throughout the Spring Creek watershed. These projects are the watershed recommendations in action.

spring creek headwaters reserve



A Forest Gateway at Galbraith Gap would enhance the entry to the abundant recreational and educational opportunities found in the Spring Creek headwaters.

A Spring Creek Headwaters Reserve in and around the Rothrock State Forest would protect several headwaters tributaries of Spring Creek and their forested, mountain subwatersheds. As a region, the headwaters possess a range of natural and cultural resources. The headwaters streams, including Spring Creek, Galbraith Gap Run, Slab Cabin Run, and Roaring Run, feed a steady supply of water to the aquifer. Through slow, yet powerful erosion, they have carved gaps that now make the interior of the mountainous terrain more accessible. The influence of previous generations on the landform and vegetation is still visible to a trained eye. Beyond their usefulness and historic value, they are simply beautiful. Lined with forests of majestic, red-barked hemlock and shrouded in dark rhododendron dells, our streams are among the most picturesque mountain streams in North America. Because of the rich diversity and abundance of resources in this region, the Spring Creek headwaters deserve special protection.



While protecting stream corridors from high impact land uses prevents erosion, conservation of the entire headwaters subwatersheds provides more complete protection of water quality.

Refer to buffer guidelines for sensitive areas in appendix a.

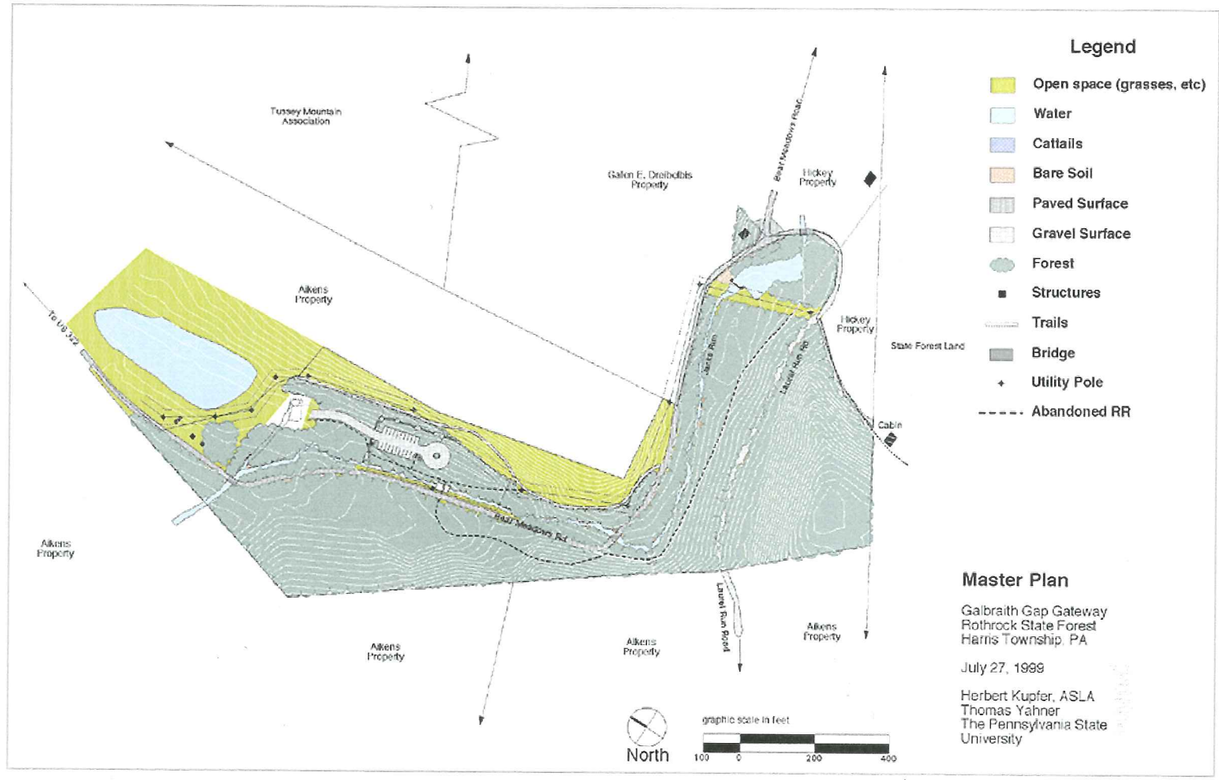
Protect headwaters subwatersheds

As discussed at the watershed scale, headwaters streams provide high quality, naturally filtered water to State College area residents via the deep, underground water supply. In addition to concern for human consumption, the headwaters are home to native brook trout and many species of amphibians, reptiles, and invertebrates. The mountain forest also provides a large, contiguous habitat for wildlife and game species.

A key strategy for the protection of headwaters streams, and other parts of the Spring Creek system, is the establishment of a stream conservation corridor. Here in the sensitive mountain headwaters, the conservation corridor would extend to at least 300 feet on each side of the stream. Within this corridor, logging and development would be prohibited in order to preserve the forest that absorbs, filters, and directs rainfall into the soils and bedrock.

But the stream conservation corridor alone cannot adequately safeguard these headwaters watersheds. The entire drainage area of these forested subwatersheds should be protected from damaging logging practices, urbanization, overuse for high-impact recreation, and other surface disturbances. Only by carefully managing land use in these areas can we protect the quality of our streams and aquifer waters.

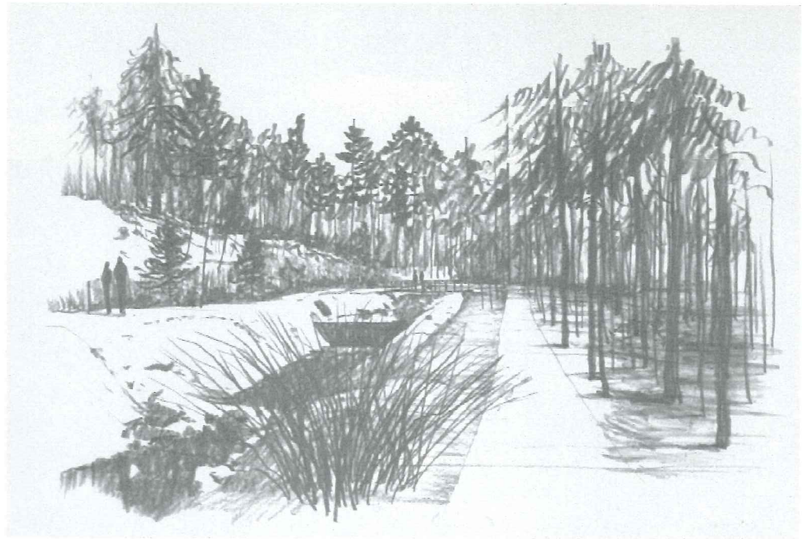
The proposed master plan for the Forest Gateway at Galbraith Gap includes public parking and trailhead signage.



The Spring Creek Headwaters Reserve at Rothrock State Forest would also preserve biodiversity. The region known as Seven Mountains is home to many plants and animals that depend upon large expanses of forest for their survival, including many native songbirds that face extinction due to the fragmentation of forested areas. The Headwaters Reserve could manage the forest to maintain large tracts of dense canopy and cover, providing much-needed habitat for these pressured species.

Create forest gateways

The Spring Creek community uses Rothrock State Forest intensively for outdoor recreation. During any time of year, one can find people hiking, biking, camping, fishing, or horseback-riding in the State Forest. Seasonally, one can also find snowmobilers, cross-country skiers and game hunters. In addition to these athletic and leisure sports, many in the community also enjoy the aesthetics of this place. Painters, photographers, and nature-loving observers seek out the beauty of its vegetation and wildlife. However, access to the State Forest is limited to a few sites at its periphery. The gaps at Galbraith and Shingletown are two of the most popular entry points. These portals and the recreational opportunities found within could be connected by a network of multi-use trails and linked to the community by an extension of the existing bikeways in Boalsburg. This system would serve the growing demand for easily accessible nature-based, recreational opportunities.



The Forest Gateway at Galbraith Gap, on the former Harris Township Water Authority reservoir site, would weave the threads of recreation, water, and history into a coherent educational outdoor experience. This Forest Gateway would provide safe, convenient, and ample parking for the many recreational users that drive to the State Forest. As the nexus for the State Forest trail network, it would be an ideal location to orient visitors with maps and guides and to post State Forest regulations. In addition, the Forest Gateways at the Galbraith Gap and Shingletown Gap could celebrate the efforts of J.T. Rothrock to protect forests and waters for future generations.

The Forest Gateway also has the potential to inform users about the critical and fragile functions of the headwaters ecosystems that they enjoy. The channelized Galbraith Gap Run along the reservoir site could demonstrate restoration of a healthy aquatic and riparian ecosystem. With an existing native brook trout population and a diverse invertebrate community, restoration of this small reach of stream at this Forest Gateway could provide public education, universal access to fishing, and trout stream restoration research and education.

Upper*: Channel restoration at Galbraith Gap could provide public education, fishing access, and native species restoration.*

Lower*: The Forest Gateway at Galbraith Gap could orient visitors to the wide range of recreational opportunities within the State Forest.*

Upper*: Remnant ties from the gravity railroad can still be seen along hiking trails.*

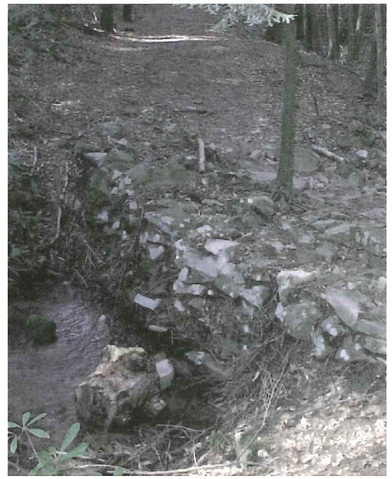
Lower left*: Several trails through the proposed Spring Creek Headwaters Reserve follow old railroad grades and cross headwaters streams at stone bridge abutments.*

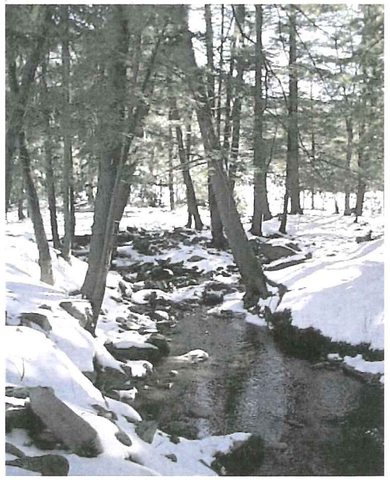
Lower right*: Though seemingly insignificant, this headwater stream once sustained the Harris Township Public Reservoir and likely supplied water to earlier Spring Creek residents.*

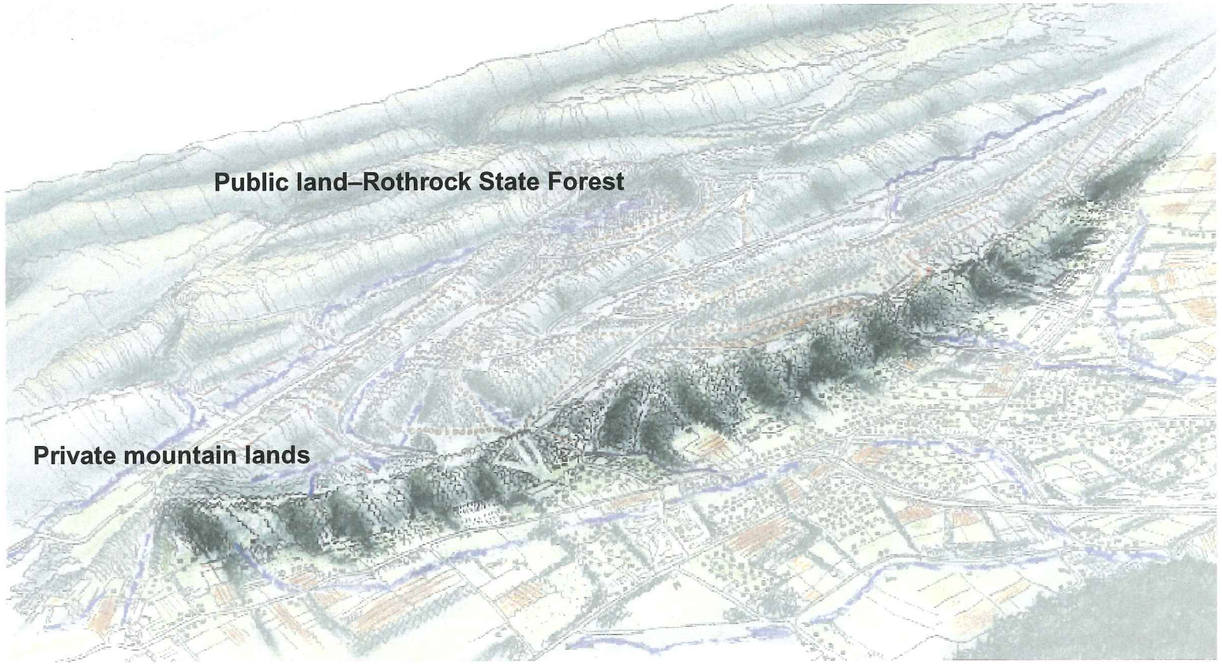
Develop with history

During the nineteenth and early twentieth centuries, the timber resources of the Seven Mountains were extensively exploited for lumber and charcoal. The old growth forests were interlaced with a network of logging railroads and cut for timber. Today we hike and drive on many of these railbeds throughout the State Forest. The observant hiker can still see charcoal hearths along trails in Shingletown Gap and in Galbraith Gap, the remains of the gravity railroad used for "wild catting" logs from Bear Meadows to the saw mill at Linden Hall. These are all part of the regional history still evident in the landscape.

These historic resources are rapidly giving way to nature's power to restore the forest, yet as part of our heritage, they deserve recognition. The trails that follow old rail lines could be marked with signs and photographs describing old logging practices. Charcoal hearths could be designated as campsites to interpret the story of the charcoal-making process. Other signage throughout high-use areas could describe changes in the forest that have resulted from resource management. Current State Forest management could demonstrate stream corridor conservation. These actions would write resource protection into the history of today.







Private ownership and management of forested, valley-facing slopes impacts our entire community's identity. Partnerships with private landowners would protect our scenic landscape.

Conserve scenic value

The headwaters landscapes constitute some of the most important scenic views from within our community. These forested, valley-facing slopes frame our community with wild, verdant mountains. We must recognize that 95% of these valley-facing mountain slopes are in private ownership. Current regulations in many locales would permit logging and some level of residential development on these highly visible slopes. It is important for the community to work in partnership with private landowners to protect both the private and public values of these sensitive landscapes.

Develop partnerships for conservation

The task of headwaters protection is great and the responsibility is communal. Only through cooperation between the community, private landowners, and the State Forest administration can we adequately protect our resources in the Spring Creek headwaters through conservation easements and other means. User groups, such as bicyclists, hikers, snowmobilers, and horseback riders, should work together with the State Forest administration toward the planning, design, construction, and maintenance of trails, signs, and improvements. By partnering with other state and federal agencies, such as the PA Game Commission and the PA Fish and Boat Commission, such groups can participate in establishing and maintaining larger and better recreational networks. Other interest groups, such as the Centre County Historical Society, could partner with the State Forest administration to preserve and interpret historical resources. The landscape of the Spring Creek headwaters has much to offer if we engage, rather than disregard, its numerous resources.

riparian parks

Riparian parks, such as the one proposed at Waddle Marsh, would provide public open space and recreational amenities for residents of the surrounding communities.

Recreational opportunities are vital to the quality of life that a community offers. They include outdoor activities such as athletics and motor sports, as well as passive enjoyment of nature while walking, camping, and picnicking. Such passive recreation includes the opportunity to experience nature, its processes, and its diversity in the local vegetation, wildlife, and streams.

As our community grows, there is a continued need to develop recreational opportunities throughout the watershed.

Existing recreational sites support the current need but will not adequately serve an expanding population. New sites and facilities will need to be developed to serve new residents.

By layering recreational needs with water resources, we enhance our recreational environment and appreciate its waters. In addition, we can demonstrate sound land management for water quality improvement. By developing parks in each of our towns and villages, we can conserve our cultural heritage as well.

Waddle, Pine Grove Mills, and Pleasant Gap belong to a set of villages that served the commercial, industrial, and social needs of the nineteenth century agricultural valley. While they no longer function as the focus of their community, their older churches, schools, commercial buildings, and houses still lend a distinct character to the region. As agricultural borders become residential neighborhoods, these villages will need to increase recreational amenities for their growing populations.

A riparian park at Waddle Marsh could inform local residents of the many ecological functions that wetlands perform.

Waddle Marsh Riparian Park

Some of the most extensive wetlands in the Spring Creek watershed can be found along Buffalo Run near the historic settlement of Waddle. These wetlands, noted for their ecological value in the Centre County Natural Heritage Inventory, could become the core of a new riparian park that preserves wetland functions and meets the outdoor recreational needs of a nearby growing residential population.

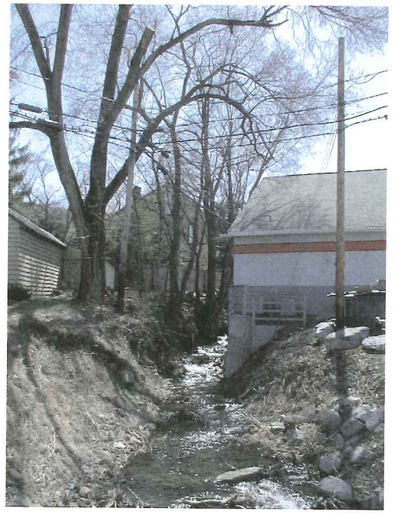
Historically, wetlands have been overlooked by both land and water resource managers, but recently they have been recognized as vital components of both systems and have been incorporated into water quality and water quantity management. By slowing the flow of surface waters, they allow sediments to settle out of suspension, vegetation to absorb nutrients, and soils to absorb and infiltrate floodwaters. In addition to their role in the hydrologic cycle, wetlands support both aquatic and terrestrial wildlife communities.

Whether Waddle Marsh is a result of natural geologic and hydrologic patterns or of historic railroad development (or perhaps a combination of both), plant and animal communities have come to inhabit this local ecosystem, and their contribution to our local ecology should be preserved.

A park at Waddle would offer opportunities for environmental education specific to wetland communities and the riparian corridor. It would also provide open space for hiking, bird watching, and fishing. By providing trail links to existing parks, such as the Benner Township Park, a local valley network for outdoor recreation would be created. A broader connection to the watershed-wide recreational network centered at Spring Creek Canyon could be made via trails through State Game Lands 176 and properties owned by the Pennsylvania State University. By this same network, residents from across the watershed could access, appreciate, and enjoy the wetlands at Waddle Marsh.

Left: *The proposed site of the Pine Grove Mills Riparian Park lies along Route 45, northeast of town.*

Right: *The population of Pine Grove Mills is growing as farms in the valley are converted to residential subdivisions. Typically, the stream corridor has not been adequately conserved. The proposed site offers opportunities to engage the stream through fishing, walking, and picnicking and could demonstrate buffers and stream corridor conservation to local residents.*



Pine Grove Mills Riparian Park

The original towns of the region were settled along streams, where water was available for use in homes and mills. Water was also valued in social settings and many towns established parks along the stream. For reasons unknown, the village of Pine Grove Mills on the upper reaches of Slab Cabin Run lacks a streamside park for its residents. This uppermost part of Penns Valley has been rapidly developing and the residents have limited access to public open space. If current trends continue, the small-scale, agricultural landscape will be transformed to a new pattern, one of suburbia and industrial agriculture.

A new riparian park along Slab Cabin Run in Pine Grove Mills would preserve open space and provide public access to the stream for current and future residents. As a recreational site, it could provide streamside facilities for fishing, picnicking, and walking. Through its design and signage, the park could offer environmental education to park users, particularly on riparian corridor management. Ecologically, it could steward Spring Creek by restoring part of the streamside forest to that tributary, thereby improving water quality, reducing erosion, and increasing groundwater recharge. By restoring the forest, a riparian park at Pine Grove Mills would benefit not only local residents but also the entire watershed community.

Upper*: The proposed site for the Pleasant Gap Riparian Park is located on Robinson Lane, adjacent to the Pennsylvania Fish and Boat Commission hatchery.*

Lower*: With anticipated growth resulting in new residential communities, this park would provide recreation and open space as well as ecological mitigation of development.*

Pleasant Gap Riparian Park

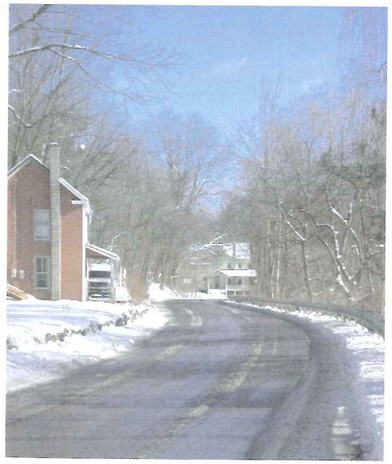
At the upper reaches of Logan Branch, adjacent to the Pennsylvania Fish and Boat Commission's Pleasant Gap site, another streamside public park could be established. Like Pine Grove Mills, this region has also seen rapid residential growth–a trend that will likely continue as a result of the new Interstate 99. A new riparian park in this part of the watershed would provide public open space and needed outdoor recreational opportunities for current and future populations of Pleasant Gap. It would also help to mitigate the impact of residential development upon the stream by restoring natural riparian vegetation that absorbs, filters, and infiltrates stormwater. Recreational paths could link the new riparian park to the existing Gettig Park and to Fish and Boat Commission lands to create a local network of connected open spaces. The Bellefonte Historic Railroad could also serve the new park, reinforcing the historic connection of Pleasant Gap with Bellefonte and Lemont. The Pleasant Gap Riparian Park could weave water, forest, history, and recreation into one public open space.

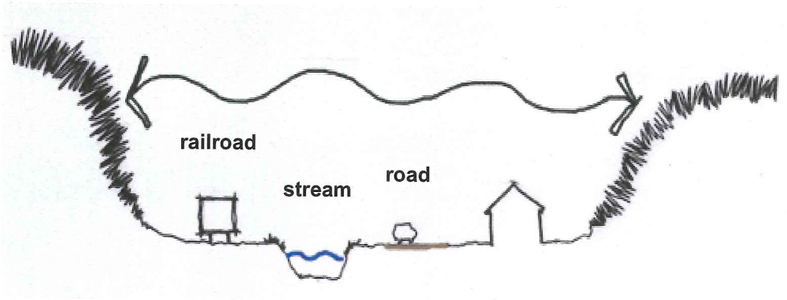
scenic corridors

While some might consider driving a chore, others find the scenery of everyday driving experiences relaxing–even recreational.

History, ecology, and scenic beauty can all be found in our valley reaches, such as Logan Branch and Buffalo and Mackey Runs. We can still see extensive patterns of early Spring Creek settlement, where water provided millpower and transportation for industry and fertile spring floods for agriculture. The streams in these valleys continue to harbor large populations of native trout. And the meandering stream corridor is still visible from the road, where modern development and transportation improvements have not tunneled and piped the waters from view. Travel along these corridors–on foot, on bike, or by car–is an experience of the human and natural landscape.

As change occurs throughout the region, country roads such as Route 550, Route 144, and Brush Valley Road provide some of the few remaining vantage points to the region's rural landscape heritage. Driving along these country roads, the driver sees an ever-changing view of stream, woodlands, farms, and villages, an experience that could also be enjoyed by bicyclists and pedestrians. It is important to preserve these "country roads" for their cultural and recreational value, even as our community enters the twenty-first century.



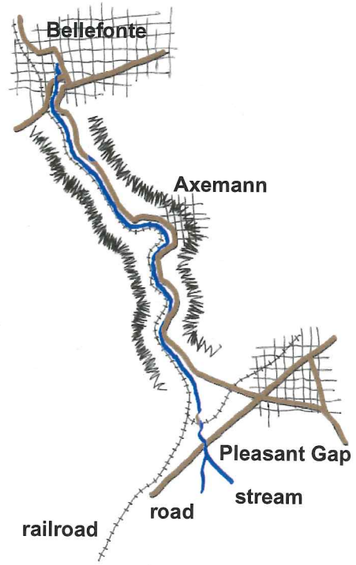


The Logan Branch corridor focuses our attention on the historic village of Axemann, the architecture of buildings, and the spatial pattern of the landscape as we travel between Bellefonte and Pleasant Gap.

Logan Branch Scenic Corridor

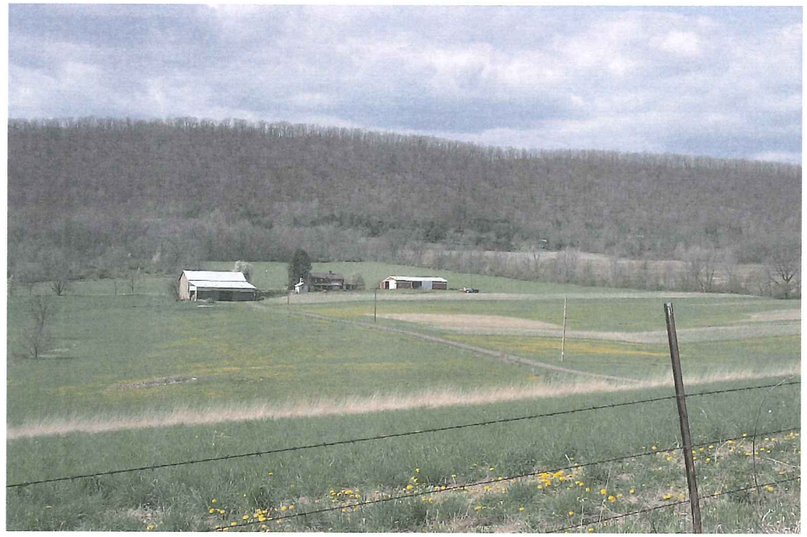
Logan Branch has deeply eroded the limestone terrain between Pleasant Gap and Bellefonte, providing a spatial corridor for travelers along historic Route 144. A journey down this winding road is history living in the present– limestone farmhouses and bank barns, the manufacturing village of Axemann, an elegant, early nineteenth century iron master's home, the historic and still active railroad, and the gurgling sounds of a high-gradient, trout-filled stream, all within forested hillsides. The slow and sinuous Route 144 reveals the history, ecology, and beauty of our watershed community in a linear progression through the landscape. These resources define our community and would easily be lost if the road were "modernized" to contemporary standards.

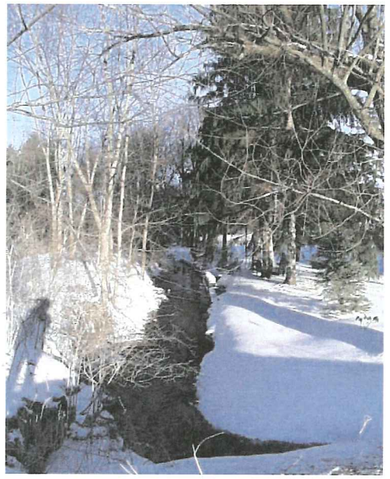
Designation of Logan Branch as a scenic byway could preserve these resources and, more importantly, the rich experience of viewing them through the corridor. With innovative design, the road could be made safely accessible to bicyclists, pedestrians, and slow-moving automobiles. Historic sites could be identified with subtle signage, encouraging observers to explore this rich, compact passageway. The relationship of the stream and its geology could be described and illustrated to explain this miniature canyon. Architectural styles, materials, and details could be interpreted to leisurely travelers. The use of this valley corridor by the Bellefonte Historic Railroad further enhances the rationale for protecting the diverse resources of Logan Branch for ourselves and for the future of our community.



Over thousands of years, this stream has carved a narrow canyon in the valley floor. Within this canyon, previous residents developed parallel routes of transportation: waterways, railroads, and roadways.

The Cedar/Mackey Run corridor gives both bikers and drivers views to historic farms and central Pennsylvania architecture, double flank hedgerows, a cold-flowing stream, and seasonal riparian vegetation.

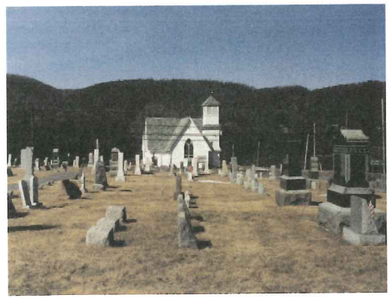


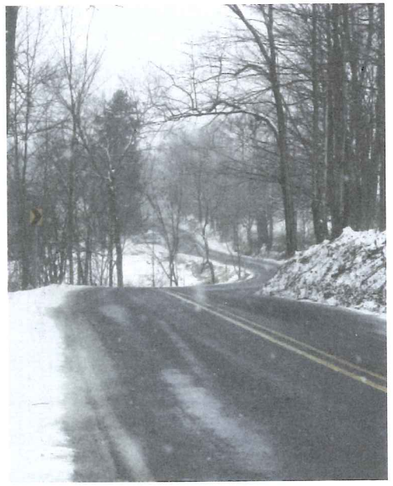


Cedar/Mackey Run Scenic Corridor

Long acknowledged as one of the region's most scenic drives, the journey by automobile, on bicycle, or on foot from Oak Hall to Centre Hall on Brush Valley Road is charming and delightful. Views of historic farms and streamside pastures, with forested Mount Nittany looming in the background, illustrate the agricultural landscape that once dominated our region. The impossibly tight nineteenth century road alignment, replete with 90 degree turns, sunken roadbeds, and double hedgerow flanks, distinguish this route from modern roadways. The route has already been recognized in its designation as a scenic bikeway, but further acknowledgement and protection are needed.

Due to its proximity to the Centre Region, Brush Valley will undoubtedly come under residential and commercial development pressures. While change is sure, the character of the corridor can be preserved with innovative design and resource stewardship. Agricultural and forest landowners, developers, interest groups, municipal officials, and state agency representatives will need to work cooperatively to meet their individual needs and to allow for the continued enjoyment of this rural route by all members of the watershed.





Left*: The Buffalo Run corridor is characterized by crossroads villages and winding country roads set against the backdrop of the forested Bald Eagle Ridge.*

Right*: Residents of this long valley landscape will need to establish conservation goals to protect the resources that define its rural character.*

Buffalo Run Scenic Corridor

Buffalo Run, the longest major tributary of Spring Creek, offers views to natural and cultural resources throughout its corridor. The rolling limestone valley, bordered by Bald Eagle Ridge, provides numerous opportunities to revere and protect these important resources. Due to the valley's proximity to growing populations at Bellefonte and Park Forest Village and its intersection by I-99, there is added impetus for such efforts.

Pennsylvania Route 550, which parallels Buffalo Run through much of the valley, is another of the picturesque, historic roads that still serve our community. The village sites that resulted from iron mining and agricultural operations in the valley remain in our modern landscape as a small crossroads church, a family store, or a short row of houses placed side by side. The road itself reveals the texture of the valley floor as it rises and falls. Roadside hedgerows filter views to forest and farm. These characteristics, collectively and simultaneously, define the experience of a drive in the country.

Key to that experience is Bald Eagle Ridge, which provides a scenic backdrop of forested mountains to the Route 550 corridor and the surrounding community. Since the entire ridge is privately owned, logging and development could occur, fragmenting the forest and drastically changing the already rare, rural character of the valley. Conservation of this contiguous background and habitat presents a special challenge for the community to work with landowners to protect public and private values.

heritage park at scotia

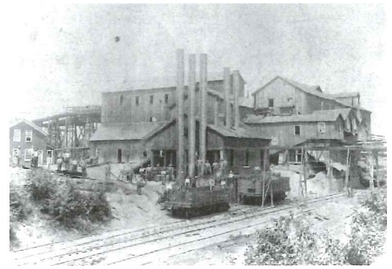
While many parts of the Pennsylvania iron industry story have already been told at sites such as Centre Furnace, the story of iron mining and village life has thus far been neglected in the Spring Creek watershed. The creation of a Heritage Park, at the site of Andrew Carnegie's nineteenth century village of Scotia, would reveal the history of iron mining and village life.

During the first half of the nineteenth century, iron ore mined in the Barrens was transported to Centre Furnace for iron production. By the late nineteenth century, Carnegie had purchased the mine lands, and named the site Scotia for his homeland. He developed Scotia into a bustling village with large open pit mines, ore processing facilities, railroad service, and a complete village life of its own. However, as improvements in iron manufacturing and competition from the Great Lakes region drew the market away from central Pennsylvania, the village struggled, ultimately closing its mines in 1914. Operation of the mines briefly resumed in the mid-twentieth century as iron was needed in great quantities for military equipment during the second World War. While most of the ore had already been extracted, the need was strong enough to motivate mining smaller, sporadic ore deposits.

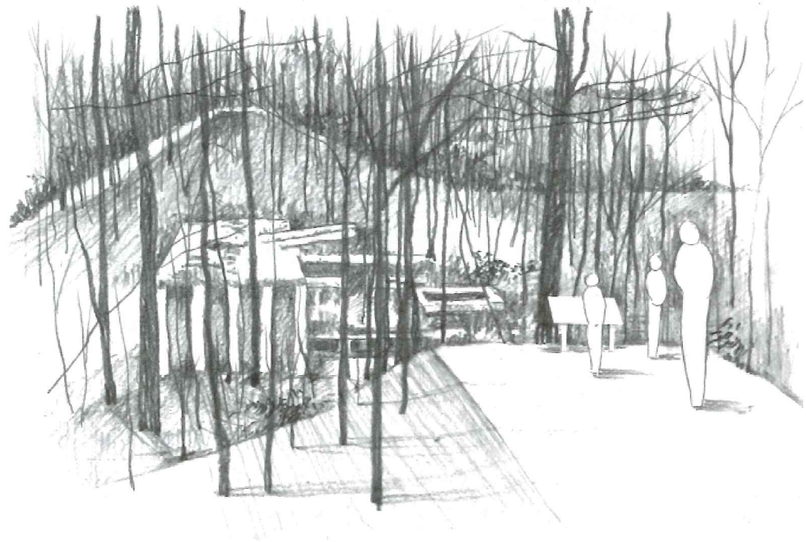
This historic map portrays Scotia as a thriving industrial village.

This site expresses multiple eras of iron ore mining history. Due to its primarily timber construction, structural elements of the original village have been lost to decay and subsequent mining activities. What remains of this era are mostly landforms and archeological sites. The latter era is more evident in the concrete frame of the twentieth century tipple and the earthen incline that we can see today. It can also be seen more subtly in the young age of the surrounding forest, dating the last significant surface disturbance. Taken together, all of these remains help to reveal the great shifts that have occurred in the story of iron ore mining in Pennsylvania over the past 200 years.

While much of this history can be interpreted through close examination of the Scotia landscape, more information about historic mining processes and mining village life is needed to illustrate the complete story. Some research has already been published, for instance Harry M. Williams' *The Story of Scotia*. However, more extensive archival, archeological, and ecological work needs to be completed and made available to the public. Partnerships with the Centre County Historical Society, the Pennsylvania Historic and Museum Commission, and the Carnegie Institute could support such efforts.



While the structures we see today are remnants of mid twentieth century mining interests, they could direct our attention to the technological changes in mining processes that have occurred over time. From historic photographs of Scotia-era structures to concrete frames we see today to their connections with Centre Furnace, we can portray the iron ore mining landscape through layers of history.

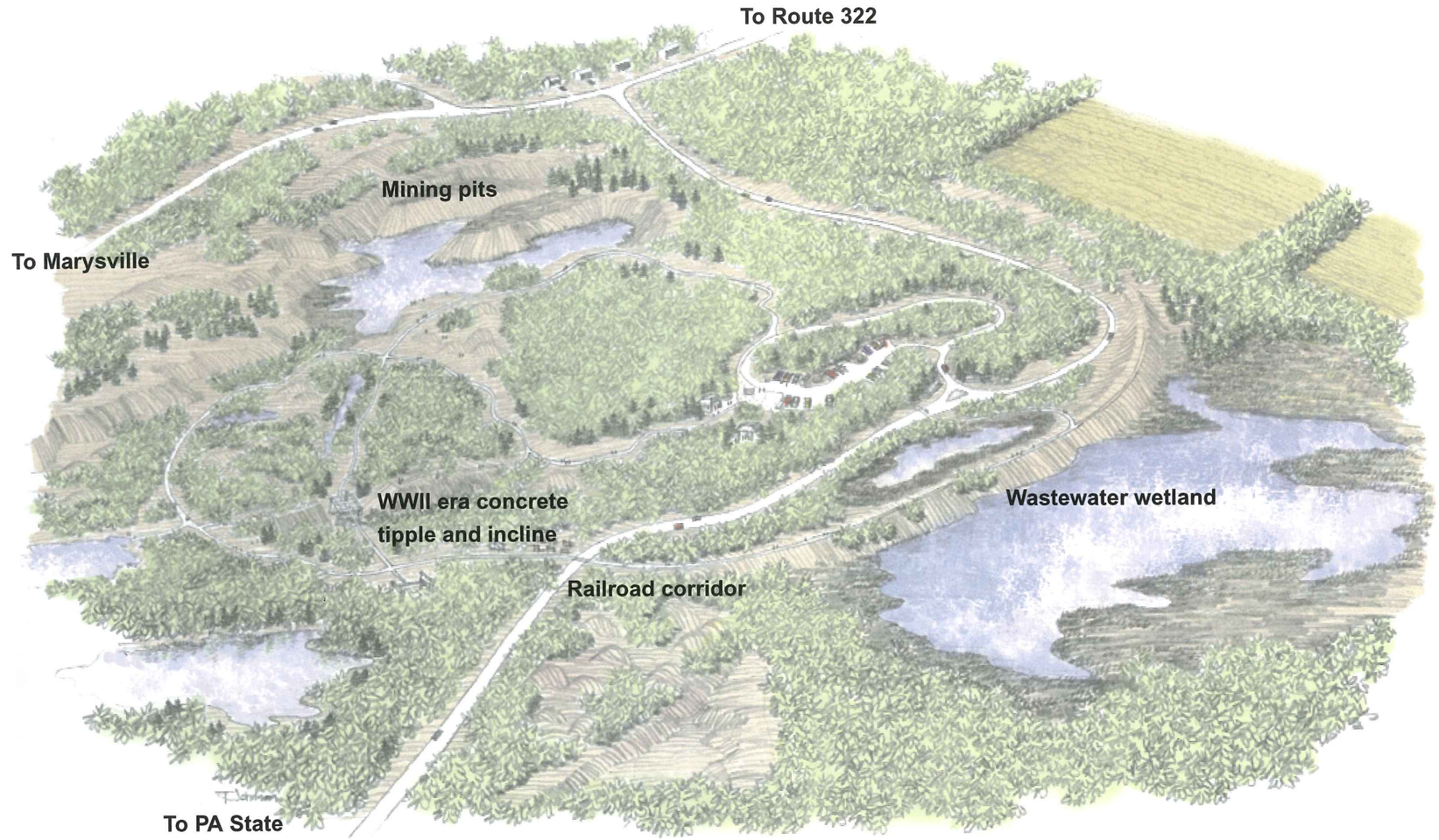


While these photographs of past and present show different locations, both resulted from stirring the layers of the landscape, impacting soils, vegetation, water, and wildlife. As an environmental component of the heritage park, mining pits and wash water areas could describe the ecological conditions that created iron ore deposits and the resultant conditions of mining these subsurface resources.

Conservation in this area is not limited to its historic resources, for the area also plays a critical role in watershed ecology. The unique geology of this area, which resulted in the expansive iron ore "banks" exploited by Carnegie and others, also helped to create an extensive series of locally rare, acidic wetlands as mining stirred the landscape. These ponds and marshes, rich in plant and animal species, provide opportunities for environmental education. Interpretive signage could explain the formative geologic processes of this region, the restorative processes of nature in the mining pits, the changes in surface conditions (soils) across the valley floor, and their impacts on habitat for both vegetative and wildlife species.

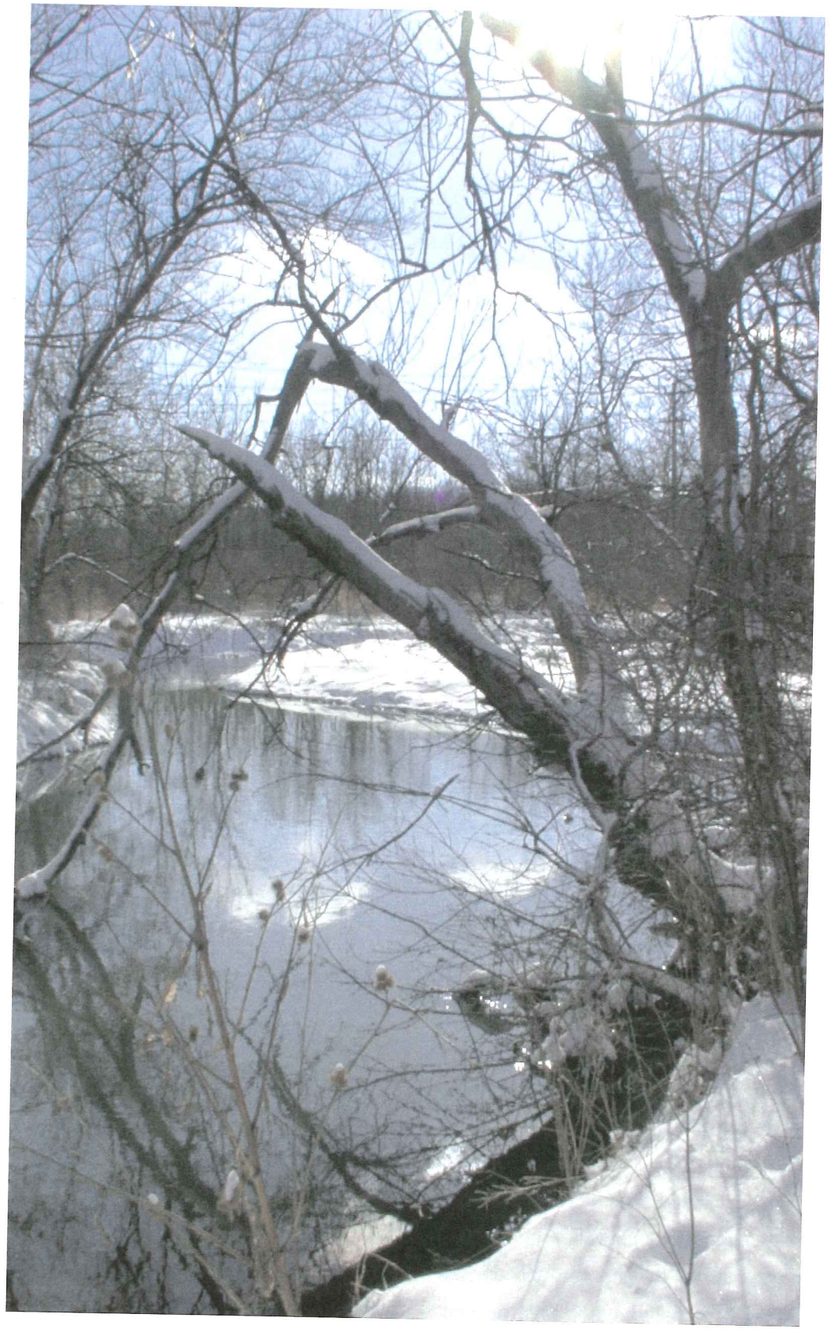
In addition, the park could become a recreational destination. The abandoned railbed provides scenic views to the varied stages and types of natural revegetation along its route: the moist, acidic pit floors that now support thriving colonies of winterberry and the forest trees that are young and dense in comparison to more mature, undisturbed valley specimens. Hikers already make use of this path as they travel to and from the State Gamelands. A new trail could lead park visitors from the early mining sites of the Carnegie era to the visible structures and definitive landforms of the latter mining period to the beautiful landscape of unintentionally created wetlands.

Finally, the belief of many experts that Bellefonte's Big Spring originates in the Barrens further supports protection of this area. The State Game Lands designation certainly restricts polluting land uses from negatively impacting water quality in this groundwater recharge area. However, acknowledging the active role this landscape plays in our local hydrologic cycle and engaging its other resources in the making of our community would draw us closer to our environment.



While more research is needed to discover the historic and ecological details of this site, ideas and visions of what this place could become provide our motivation. Imagine walking through time: entering the park through acres of forest, perhaps along a path traveled by miners from their houses to the ore pits, descending into the now grassy pits, where water once flooded miners feet, hiking the rail lines that brought raw iron ore to the washer, ascending the now tree-covered incline where carts weighing hundreds of pounds were pulled to the top and emptied into the hopper, walking through the solid structure where soil and organics were washed from the ore chips with streams of water tapped from local wells, passing the scrubby fields where the fouled waters deposited layers of fine sediments that created present day wetlands, and finally leaving the park along the rail lines that transported the clean ore to local furnaces. With visions such as these, we can bring history and nature to life within public open space.

Summary and Conclusions



The landscape of the Spring Creek watershed is an intricate fabric of streams and forests, fields and mountains, roads and railroads, and modern towns and historic rural villages. The watershed, in the heart of central Pennsylvania, is part of the larger cloth of the Susquehanna River and Chesapeake Bay watersheds. Located in south central Centre County, in the Ridge and Valley physiographic region, Spring Creek drains an area of approximately 175 square miles. Within the Spring Creek watershed, fourteen municipalities are searching for new and creative ways to weave together their common interests, heritage, and resources. The watershed contains all or portions of Benner, Boggs, College, Ferguson, Halfmoon, Harris, Patton, Potter, Spring, and Walker Townships and the Boroughs of Bellefonte, Centre Hall, Milesburg, and State College.

In 1997, ClearWater Conservancy received a planning grant from Pennsylvania's Department of Conservation and Natural Resources Rivers Conservation Program to prepare Phase II of the Spring Creek Study and mold it into a Rivers Conservation Plan for the entire stream network. Phase I of the Spring Creek Corridor Study (Penn State Department of Landscape Architecture, 1995) had documented much of the main stem of Spring Creek and several important tributaries, including Big Hollow and the lower reaches of Cedar Run and Slab Cabin Run. Phase II extended the conservation plan to the remaining tributaries of the Spring Creek watershed, including Buffalo Run, Logan Branch, Galbraith Gap Run, and the upper reaches of Slab Cabin Run, Spring Creek, and Cedar Run. Phase II also included the conversion of earlier Phase I data to a common geographic information system (G.I.S.) format (ArcView).

Public presentations were made of preliminary study recommendations, and public comments from those events, and others, were incorporated into the final study recommendations. Final study recommendations were presented to the public through a computer-based presentation and broadcast on local C-NET on February 22, 2000. Final editing and production of the study report and display boards was completed in May 2001.

With the continued leadership of the ClearWater Conservancy, the communities of the Spring Creek watershed have begun to recognize the value of Spring Creek as an important asset for the future. Spring Creek's special regulatory status as a High Quality Cold Water Fishery is a reflection of the environmental quality of the watershed and the quality of life of the people who live, work, and play there. In order for these communities to adequately consider Spring Creek in their ongoing decisions about land use planning and community design, public awareness of the value of the creek must be enhanced. The Spring Creek Study and the Spring Creek Rivers Conservation Plan are intended to provide that foundation and give the communities specific ideas for the future of the watershed.

The conclusions of this study were grouped together as either watershed-wide recommendations (those applicable to larger areas or throughout the study area) or site recommendations, for specific locations within the watershed.

Watershed Recommendations:

- Conserve and Protect Water Resources
  - Protect headwaters subwatersheds
  - Protect groundwater recharge areas
  - Establish a stream conservation corridor
  - Create a "ribbon of green" – riparian forest buffers
- Conserve and Protect Historic and Cultural Resources
  - Acknowledge and inventory evidence of our past
  - Develop with history
- Conserve and Protect Scenic Resources
  - Conserve forested mountain slopes
  - Protect scenic travel corridors
  - Enhance visual awareness of Spring Creek and tributaries
- Establish and Enhance Recreational Networks
  - Establish new recreational destinations
  - Enhance recreational connections
  - Network beyond the watershed

Site Recommendations:

- Spring Creek Headwaters Reserve
  - Protect headwaters subwatersheds
  - Create forest gateways
  - Develop with history
  - Conserve scenic values
  - Develop partnerships for conservation
- Riparian Parks: Waddle Marsh (Buffalo Run), Pine Grove Mills (Slab Cabin Run), Pleasant Gap (Logan Branch)
  - Create new parks
  - Protect riparian areas
  - Provide public access to nature
  - Create a "ribbon of green" - riparian forest buffers
- Scenic Corridors: Logan Branch (PA Route 144), Buffalo Run (PA Route 550), Cedar/Mackey Run (Brush Valley Road)
  - Value the view from the road
  - Preserve natural, cultural, and scenic resources
  - Preserve historic road alignment
  - Establish special management and design standards

• Heritage Park at Scotia

Protect, reveal, and interpret iron mining history

Attend to all historic eras – Centre Furnace, Andrew Carnegie, World War II

Protect and interpret special ecology of Scotia Barrens

Create recreational destinations

The ClearWater Conservancy and the residents of the Spring Creek watershed are excited to move forward to implement the recommendations of the Spring Creek Study (Phases I and II) and the Spring Creek Rivers Conservation Plan. Progress is already underway on many fronts, but possibly the most exciting opportunity before the community is the creation of a comprehensive watershed plan for the fourteen municipalities of the Spring Creek watershed. The Spring Creek Watershed Commission, convened by the Centre County Commissioners and composed of an elected official from each of the municipalities in the watershed, will lead that effort in partnership with the Spring Creek watershed community, ClearWater Conservancy, and other interested state and local stakeholders.

The ClearWater Conservancy would like to thank the Pennsylvania Department of Conservation and Natural Resources for helping to make this Rivers Conservation Plan possible and for its continued support of Spring Creek watershed initiatives.

appendix a

the stream conservation corridor: promoting diversity, clean water, and healthy streams

Background

The health and diversity of the Spring Creek watershed depends upon the conservation of riparian areas. "Local land-use practices can impact not only the immediate riparian zone area, but also can influence water quality and areas located further downstream" (Barsk 1996). For example, excessive forest cutting or the mismanagement of agricultural lands can accelerate soil erosion that can in turn affect downstream aquatic habitat and species populations. Development that increases impervious surfaces, decreases infiltration capacities and increases runoff, elevating stream flow quantities and the energy that accelerates soil erosion processes. Agriculture and roads can contribute nutrient and sediment laden runoff directly into streams and aquifers, endangering both drinking water supplies and species habitat. Because all of these land uses occur in the Spring Creek watershed, stream conservation that targets land use is clearly needed.

Forested buffers offer land management options for mitigating these impacts. They have proven to effectively remove excess nutrients, particularly nitrogen and sediment-attached phosphorus, and are moderately effective at removing excess metals and other nutrients from overland and subsurface stormwater. A minimum buffer width of 30 feet on each side of the stream is generally recommended for nutrient dilution and stormwater infiltration. A minimum 50 foot buffer on each side of the stream is recommended for the removal of excess sediment. In addition, forested buffers control erosion by stabilizing stream banks and wetland edges and by promoting infiltration (Shisler et al 1987).

A stream conservation corridor can combine land use conservation and land management (buffers) for the protection of water quality and aquatic habitat. Proper planning and management of these areas will also foster diverse native plant and animal habitats, improving the overall ecological health of the Spring Creek watershed.

Spring Creek Watershed Goals

The specific goals of the stream conservation corridor are:

- to decrease nutrient and sediment loading;
- to minimize thermal pollution, especially during critical seasonal periods;
- to mediate increased stormwater discharge by promoting infiltration in riparian areas;
- to promote plant and animal species diversity, high quality habitat, and habitat connectivity;
- to promote scenic and recreational opportunities; and
- to encourage visual access to the stream, utilizing vegetation as an attribute.

These goals guided the development of the land-use specific recommendations.

Criteria for Riparian Buffers

The Chesapeake Bay Riparian Handbook outlines four criteria that significantly influence riparian buffer widths for water quality protection:

- the intensity of adjacent land use,
- the sensitivity of the resource to be protected,
- buffer characteristics at the site and watershed scales: integrity and continuity, and
- the specific water quality and/or habitat functions desired.

These criteria were considered in the development of recommended widths for the riparian buffers in the Spring Creek watershed.

The intensity of adjacent land use

Following the work of Lowrance et al in the Chesapeake Bay Study and the Interagency Handbook on stream corridor restoration, we can broadly classify the land use types into four categories:

- Urban /developed
- Agriculture
- Silviculture
- Sensitive (defined below)

Ideally, buffer width will be set according to both the intensity and type of adjacent land use. Realistically, buffer width may be constrained by the amount of available, undeveloped land and the cooperation of landowners adjacent to the streams. The recommendations laid out in the text are thus general and should be applied only after detailed, site-specific study.

The sensitivity of the resource to be protected

Not all areas of the riparian system are equally sensitive to land use impacts. Areas of highest sensitivity in the Spring Creek watershed include headwaters

subwatersheds, recharge areas, and wetlands. Headwater streams provide source water for subsequent tributaries, drinking water supply for the community, and habitat for high quality coldwater fisheries. Aquifer recharge areas feed the ground water table, another source of potable water for the community. Wetlands provide refuge for countless species in addition to filtering excess nutrients and sediment. These areas are critical to maintaining high water qualities and at the same time are particularly sensitive to adjacent disturbance.

As a result of hydrologic and geologic factors, the following areas are considered sensitive in the Spring Creek watershed and should be buffered* (Lowrance et al, The Federal Interagency Stream Restoration Working Groups, 1990):

• areas adjacent to permanent or intermittent streams which occur at the lower edge of up-slope cropland;

• areas at the margins of lakes or ponds which occur at the lower edge of up-slope cropland, grassland, or pasture;

• areas at the margins of intermittent or permanent flooded, environmentally sensitive open water wetlands which occur at the lower edge of up-slope cropland, grassland, or pasture;

• areas on karst formations at the margin of sinkholes and other small ground water recharge areas occurring on cropland, grassland, or pasture;

• all areas within the 100-year floodplain;

• all undevelopable steep slopes adjacent to the water body (in excess of 25% slope); and

• any adjacent wetlands or critical habitats.

**Again, buffer widths are naturally dependent upon existing land ownership and development.*

Buffer characteristics at the site and watershed scales: integrity and continuity

A buffer will be most effective if it is continuous around the entire stream system. It follows that a fragmented or noncontinuous buffer will be less effective since stormwater and its pollutants are able to bypass the forested filtration area. Buffers that discharge to the stream must direct water through the riparian soils and vegetation in order to filter and infiltrate the water. "It is only under these conditions that flow output can be treated as the output from the riparian forest system" (Lowrance et al, 1997).

The specific water quality and/or habitat functions desired

In some areas, water quality is heavily dependent upon water cycling through soils and the underlying geology (Lowrance et al). Located in the Ridge and Valley Province, Spring Creek is dominated by limestone (karst) valleys and sandstone ridges. Karst topography promotes direct aquifer recharge, and thus riparian buffers are less effective. Lowrance, et al 1990, developed the following guidelines with respect to underlying geology:

In the valleys of the Ridge and Valley Province, which are dominated by limestone (karst) topography, buffers will have the least potential for nitrate removal. Porous karst topography promotes direct infiltration of runoff into the local aquifers. This runoff often bypasses forested riparian areas, which would remove nutrients and sediment discharging directly into the bedrock through seeps, springs, and floodplains. Thus, regions characterized by limestone bedrock are critical areas to protect. Deep-rooted vegetation that reaches or approaches the water table, can play a pivotal role by promoting nutrient removal from groundwater that otherwise bypasses riparian filtration at the ground surface.

The ridges of the Ridge and Valley Province, which are dominated by sandstone and shale bedrock, will have greater potential for nitrate removal than karst areas because runoff tends to flow through naturally filtering riparian areas. Wide, healthy riparian forested areas can function effectively here to maintain water quality standards. Due to some aquifer recharge occurring in these areas, deep-rooted vegetation is also recommended to filter groundwater supplies found in the regional aquifers.

Guidelines for riparian buffers in the Spring Creek watershed

Urban/developed areas (see figure a.i)
Due to existing development and infrastructure, ideal buffer widths are not always realistic for urban areas, but are included for riparian protection in developing areas. Under any urban condition, the undisturbed forest buffer should be no less than 30 feet wide on each side of the stream. Widths for three zones of buffer management (see figure) are as follows:

Minimum	Ideal
30'….	30' undisturbed forest
50'….	100' managed forest
25'….	25' grassy vegetated filter strip

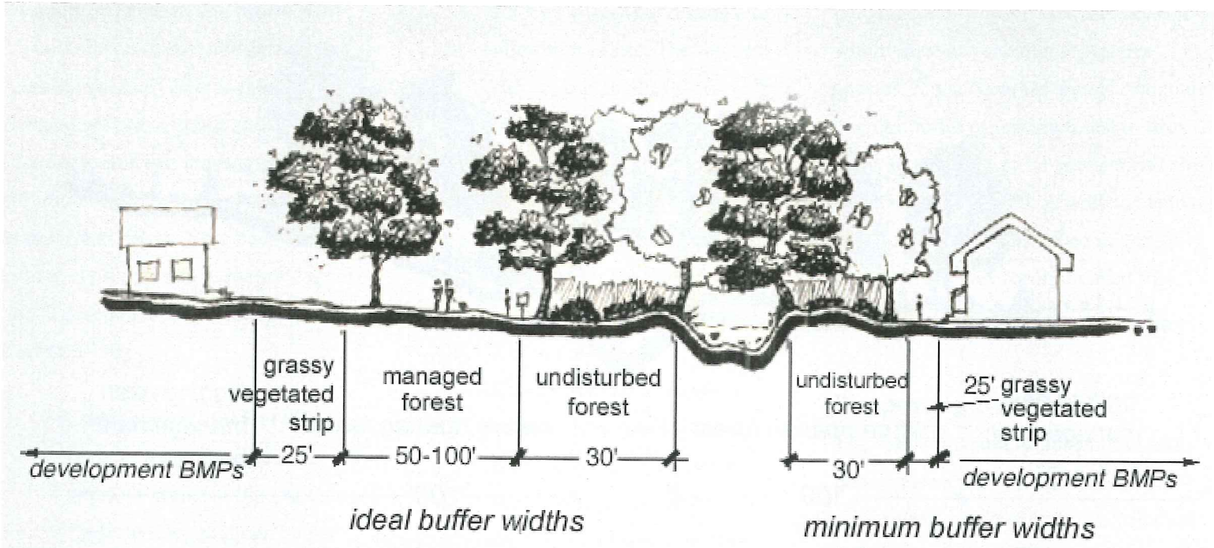
Agricultural areas (see figure a.ii)
An unbuffered stream within an agricultural landscape can be vulnerable to nutrient and sediment loading and thermal pollution. A study on the effects of livestock grazing in riparian areas adjacent to Spring Creek, Slab Cabin Run, and Cedar Run found that riparian grazing significantly impacted stream ecology; it degraded spawning habitats for brown trout, yielded declines in benthic macro-invertebrate (bottom dwelling insects) and Wild Brown Trout densities, and elevated erosion processes (Wohl and Carline 1996). Another study determined that eroded stream banks in grazed areas were a major source of elevated stream turbidity; it was also found that lack of adequate riparian shading led to thermal pollution (Yankey et al 1991).

In these agricultural areas, grassy vegetated filter strips adjacent to the stream along the agricultural areas can efficiently filter nutrients and sediment emanating from agricultural practices. In addition, these strips can be used as through-ways for tractors. The following widths (see figure) are recommended:

Minimum	Ideal
30'….	30'+ undisturbed forest
30'….	50'-100' managed forest
25'….	25' grassy vegetated filter strip

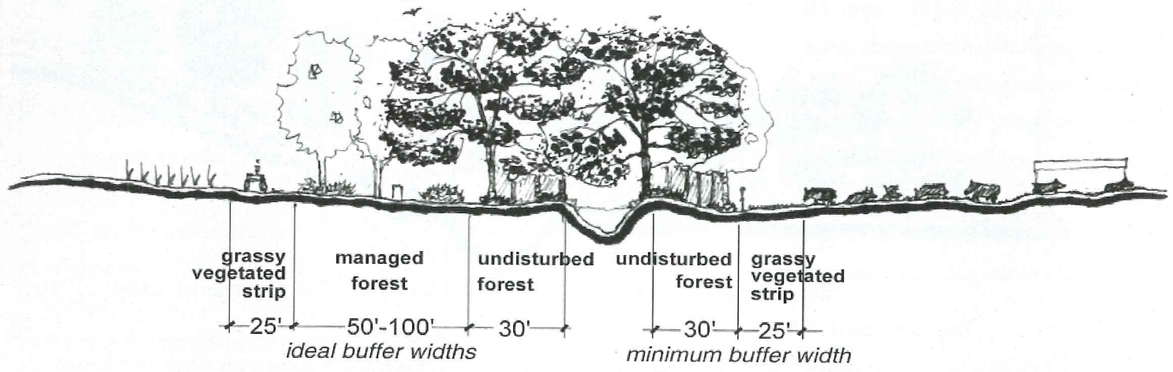
In addition to buffer zones, best management practices (BMPs) that follow the Natural Resource Conservation Service (NRCS) guidelines should be employed for agricultural practices. The NRCS also offers funding and/or technical assistance (as discussed below). Recommended BMPs include:

- Minimize 'riparian grazing.'
- Implement stream fencing.
- Limit livestock access to the stream to a reinforced stream crossing area.
- Utilize cover crops to minimize erosion and thus deter in-stream sediment buildup.
- Establish vegetation in areas sensitive to erosion.
- Employ terraces or diversions to serve as temporary detention basins for excess runoff.
- Moderate nutrient rich barnyard runoff and manure storage to minimize runoff into the adjacent waterways.
- Establish "grassed waterways" or swales to allow for infiltration.



urban / developed land

figure a.i



agricultural land

figure a.ii

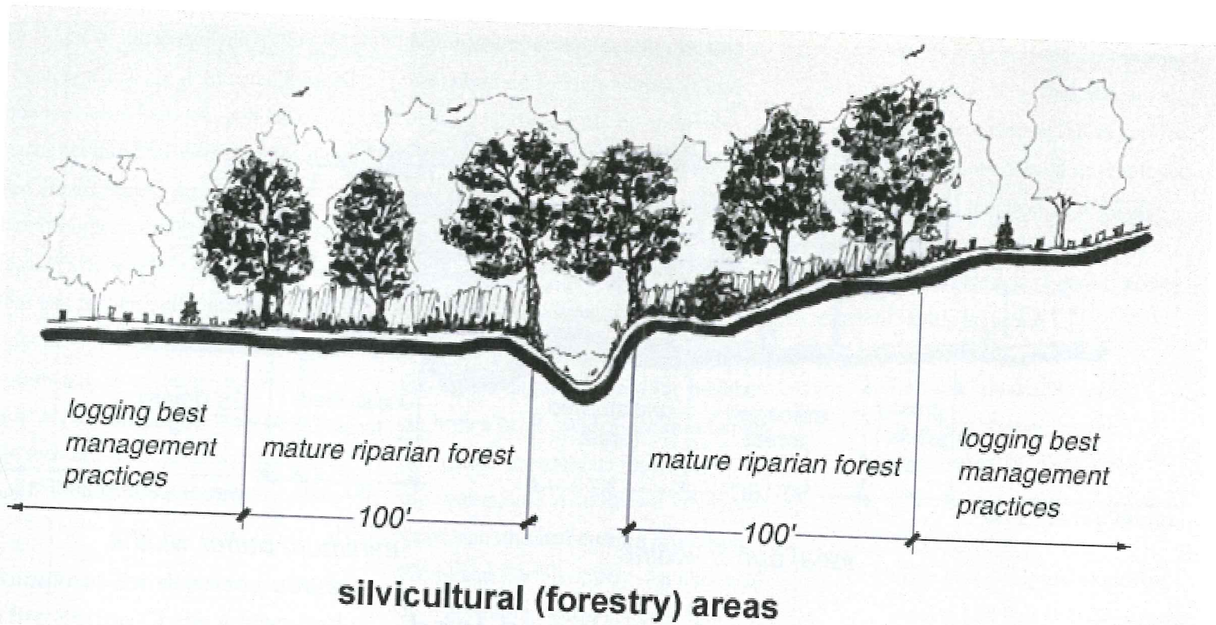
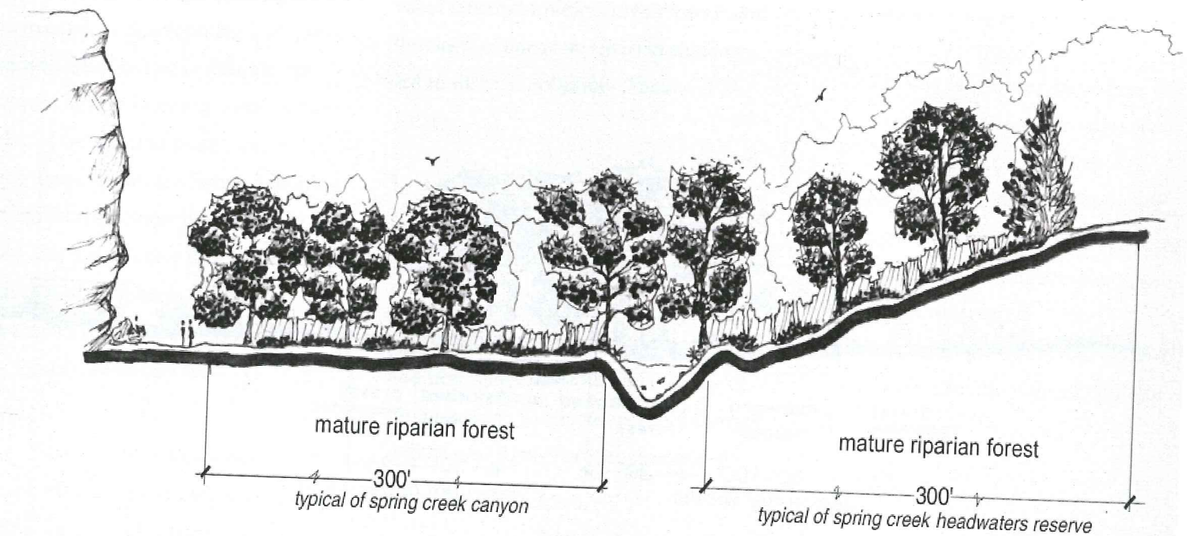


figure a.iii

silvicultural (forestry) areas

figure a.iv



sensitive areas

Silvicultural areas (see figure a.iii)
An unbuffered stream adjacent to a silvicultural (logging) area is vulnerable to elevated sediment yields and erosion in addition to nutrient loading and thermal pollution. Best Management Practices, as described below, have been shown to effectively limit stream quality degradation. These practices include (Lynch and Corbett 1990):

- A minimum of 100 feet (starting at bankfull) of undisturbed riparian forest buffer per side. Selective logging can be permitted in this zone for individual trees that threaten the stream channel.
- Harvesting divided into blocks – one block must be completed before another commences to ensure efficiency.
- Frequent site inspections by a professional forester. These inspections should be more frequent during wet periods.
- Skidding prohibited over perennial streams unless approved. If approved, skidder crossing should be designed in a manner that limits damage to the stream.
- Slash prohibited within 25 feet of all streams.
- Main skid trails and logging roads laid out by a professional forester before harvesting and allowed to settle. The loggers can lay out smaller roads if they consult with the professional forester beforehand.
- Log landing sites selected by a professional forester in cooperation with the logger. They should be no closer than 300 feet to the stream.
- All roads and trails 'properly retired.' This entails proper removal of all culverts and installation of water bars and other drainage devices. Site grading should be returned to pre-logging conditions. Gates should be used to eliminate future vehicular road access.
- Logging prohibited during excessively wet periods as deemed appropriate by the supervising forester.
- Performance bond (set at 25% of the timber's value) required prior to logging.

Sensitive areas (see figure a.iv)
Areas characterized by steep slopes, development-sensitive soils, or that are ecologically valuable (or adjacent to areas of high ecological value) are considered sensitive. Examples of these areas include large patches of undisturbed forest, areas that have a high percentage of forest cover, and areas where there are endangered or rare species. Sensitive areas should maintain a wider buffer of mature forest to promote aquatic-terrestrial connections and foster wildlife habitat. A width of at least 300-600 feet of undisturbed or carefully managed forest is recommended for these areas.

Supporting Research

The following paragraphs outline additional research that supports the development and implementation of riparian buffers for water quality protection.

Temperature Moderation:
Trees cut in areas immediately adjacent to stream channels promote the elevation of water temperatures due to an increase in direct sunlight penetrating the water. Maintaining buffers zones along the stream and utilizing BMPs with respect to cutting resulted in a reduction of stream temperature fluctuation (Lynch and Corbett 1990, Yankey et al 1991). Castelle et al (1995) found that a minimum of 15.2 m (49.9ft) is necessary for adequate shade.

Nutrient removal:
Doyle et al found a 30 foot grassy filter strip was 96-99% effective in removing nitrogen, phosphorus, and potassium; this study further suggested a 12 foot

width be set as a minimum to reduce these nutrients. Daniels and Gilliam (1996) found a range of 9-60 feet to decrease levels of nitrogen in forested buffers. In this study, 60 feet decreased levels of nitrogen by as much as 30 mg/l in areas with a high water table and shallow groundwater movement near the root zone. Lynch et al (1985) found a 98 foot (30 m) buffer reduced nutrient levels in water beyond drinking standards.

Sediment removal:

Increased stream turbidity is associated with urbanization, agriculture, and silviculture (Lynch and Corbett 1990). Castelle et al (1995) found a 20-25 foot grassy vegetated filter strip was 96-99% effective with respect to sediment removal.

Stormwater:

Buffer zones can effectively slow water runoff velocity and promote runoff infiltration. Bertelli (1981) found a 17-32 foot minimum per side to be effective for managing stormwater infiltration for a 100-year flood event.

Noise reduction:

A 20 foot forested buffer is required to minimize noise that occurs along busy streets (Harris 1985, Groffman et al 1990). Noise pollution can disrupt the mating patterns of many animal species.

Wildlife diversity:

Studies have consistently found that diversity, abundance, and species richness can all be positively correlated to buffer width (Milligan 1985, Miller et al 1997 (birds), Ehrenfeld 1983). Recommended buffer widths will vary based upon desired habitat. It will be necessary to rely on both land use and land cover maps to establish recommendations for areas that promote wildlife diversity.

Terrestrial-aquatic interaction is key to promoting aquatic species and terrestrial species diversity. Lack of connectivity can result in (Schlosser 1991):

- reduced numbers of adult and juvenile fish due to loss of habitat heterogeneity,
- decreased size and structure of the fish populations, and
- increased juvenile fish populations due to an increase in shallow areas.

Fishes: A general minimum standard of 100 feet can be recommended for establishing fish habitat although specific recommended widths will vary based upon species. A minimum of 100 feet is recommended for trout and for normal Salmonoid production and development (Moring 1982) and for normal benthic invertebrate populations (Erman 1977). Critical periods for fishes include the warm, low discharge periods of the summer months and spawning and hatching periods.

Reptiles: Reptiles generally breed in upland terrestrial environments; therefore aquatic-terrestrial linkages are particularly important. Semlitsch (1998) found that a 534 foot wide buffer would maintain a 90% Salamander population. Brown et al (1987) recommended a 50 foot minimum buffer for semi-aquatic turtles.

Birds: A general range of 250-300 feet of forested buffer, per side, is recommended to maintain healthy bird populations, with widths varying depending on specific species (Brown et al 1987). Large-scale ecological landscape variables also have a strong effect on bird populations; patch size, edge, and percent coverage all play a part in determining the abundance and richness of species. A width of 300 feet is recommended for neotropical migrant species (Broderson 1973).

Mammals: A width of at least 536 feet of forested buffer is recommended to support a broad variety of mammalian species (Brown et al 1987).

Assistance and Incentive Programs:

Numerous government-sponsored programs exist to help landowners implement buffer zones along their property. Most work closely with landowners, providing technical assistance to develop sustainable land use practices and minimize stream degradation. Some provide financial assistance for implementation, while others offer landowners incentives to implement conservation practices.

Wetlands Reserve Program:

Designed to restore and protect wetlands on private property, the wetlands reserve program offers landowners financial incentives to retire marginal farmland. It serves to establish fish and wildlife habitat, improve water quality, protect biological diversity, and provide recreational opportunities. Riparian areas can be restored and must be maintained for at least ten years. The government will fund up to 75% (cost-share) of the restoration activity.

Wildlife Habitat Incentives Program (WHIP):

WHIP is designed for private landowners who want to develop and improve fish and wildlife habitat on their land. Plans are developed through consultation with local conservation districts who provide technical and financial assistance.

Conservation Easements:

Conservation easements are voluntary legal agreements created between private landowners (grantors) and qualified land trusts (grantees) that limit land use practices and protect land from development. Grantors can receive federal tax benefits for donating easements as well as a reduction in income, property, and estate taxes. Grantees monitor the land and enforce the easement. Easements can apply to the entire parcel or one specific portion of the property. Most are permanent and follow the land even after it is sold, however term easements, are set for a limited number of years.

Streambank Fencing Program:

The Pennsylvania Fish and Boat Commission offers assistance and cost-share incentives to producers for fencing off stream areas adjacent to agricultural lands. The program attempts to minimize the effect of cattle grazing on the stream.

Conservation Reserve Program:

This program targets the protection of wetlands and forested riparian wildlife areas through the Natural Resource Conservation Service (NRCS) and Pennsylvania's Bureau of Forestry. A 50% cost-share is provided with annual payments up to $50,000 for 10-15 years. A 20% bonus incentive is added for trees and continuous enrollment.

Forestry Incentives Program:

The Forestry Incentives Program, implemented by NRCS and the US Forest Service, is applicable on areas of 10-100 acres. Up to 65% cost-share is offered for tree planting and preparation.

AM:

AM is a US Forest Service program, applicable to private forests ranging from 1-1000 acres that will be maintained for at least ten years. As much as a 65% cost-share for SIP (Stewardship Incentive Program) practices is available, including those aimed at riparian and wetland protection and improvement.

Environmental Quality Incentives Program:

This long-term program is applicable on agricultural land, including forests. Up to 75% cost-share is available from NRCS for riparian forest buffers and related practices.

Federal: PL96-451:

This program provides federal income tax incentives to reduce reforestation costs. The law permits up to $10,000 of capitalized reforestation costs each year to be eligible for an investment tax credit and seven-year amortization.

Farmland and Forest Land Assessment Act:

Also known as the Clean and Green Act, programs under this legislation can grant a preferential assessment for ten or more contiguous acres of land devoted to agriculture, forest reserve, or open space.

Reforestation Tax Credit:

This provides a 10% tax credit for reforestation capital.

Stewardship Incentive Program (SIP):

SIP provides a cost share of up to 75% for capital and planning costs.

Woodland Incentive Program (WIP):

WIP provides a cost share of 50% for forest protection practices, including capital, planning, and maintenance.

Community Forestry Program:

This program provides matching grants of 50% to government agencies and 90% to other organizations.

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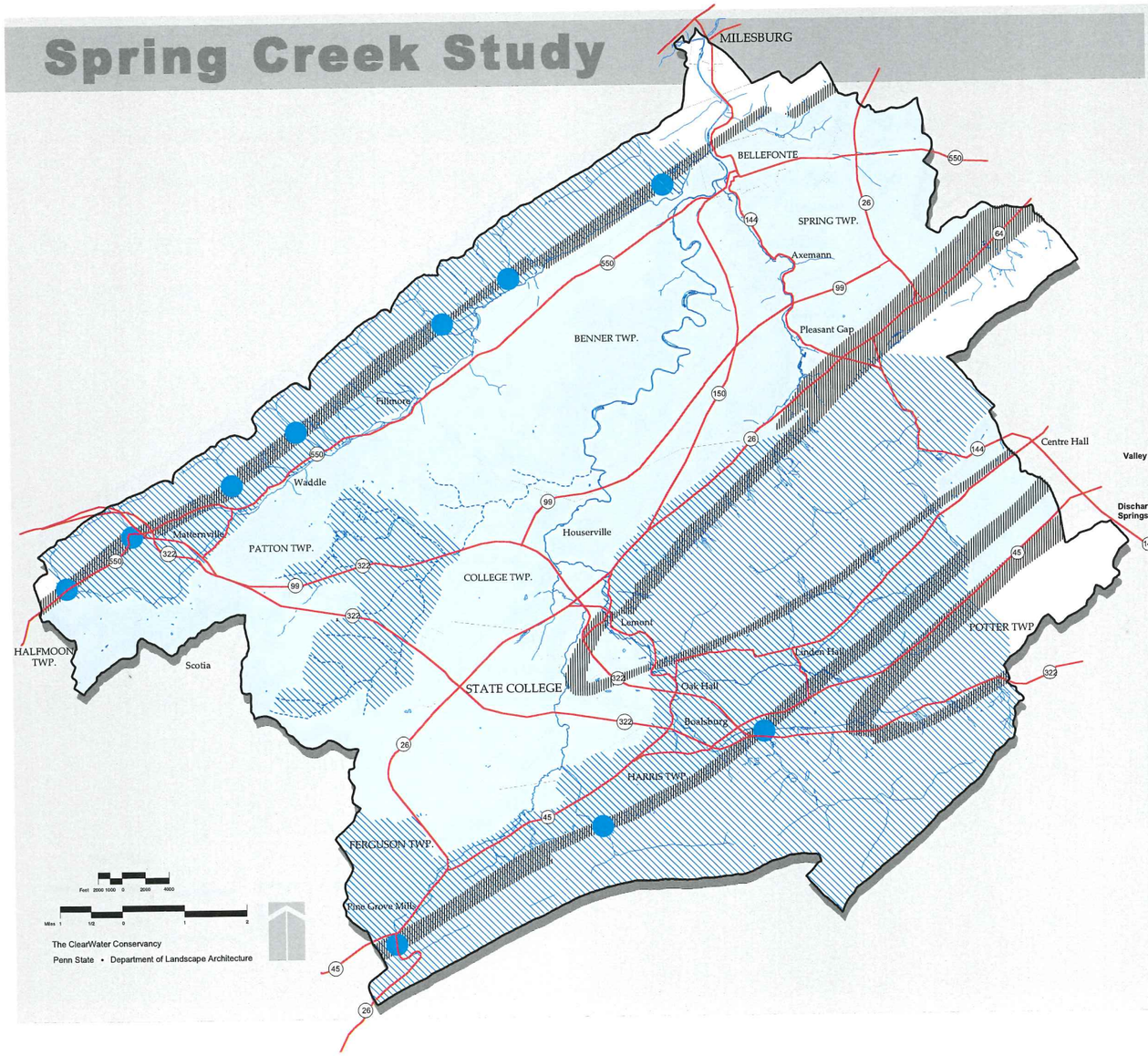
appendix b

resource and recommendation maps

The maps contained in this appendix are included as a reference of the watershed-wide inventory and recommendations that resulted from this study. They are available for viewing at their full size (24" x 36") at the Clearwater Conservancy office.

Spring Creek Study



Water Resources

Protect headwaters watersheds

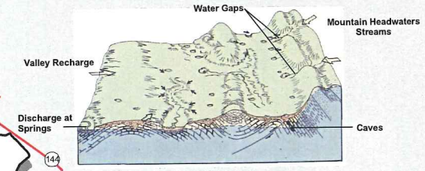
Headwaters watersheds

Protect groundwater recharge areas

Primary recharge zone

Secondary recharge zone

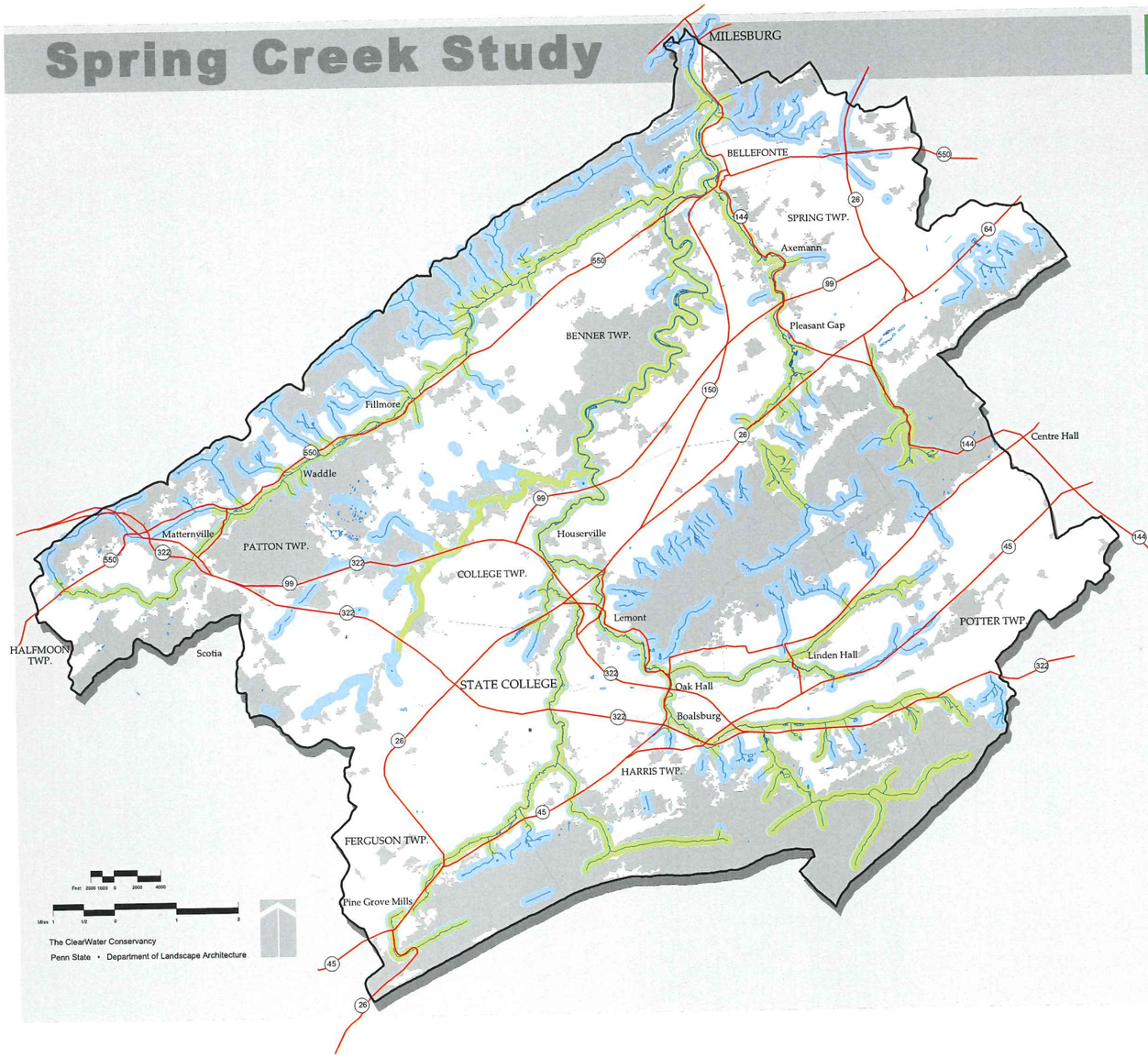
Diffuse valley recharge



Hydrogeologic block diagram

Mountain headwaters stream

Spring Creek Study



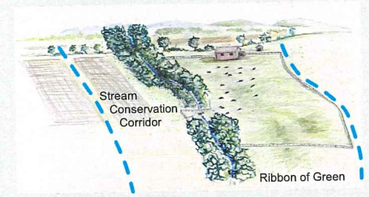
Stream Corridors

Create "Ribbon of Green"

Riparian forest buffer

Establish stream conservation corridors

Stream conservation corridor

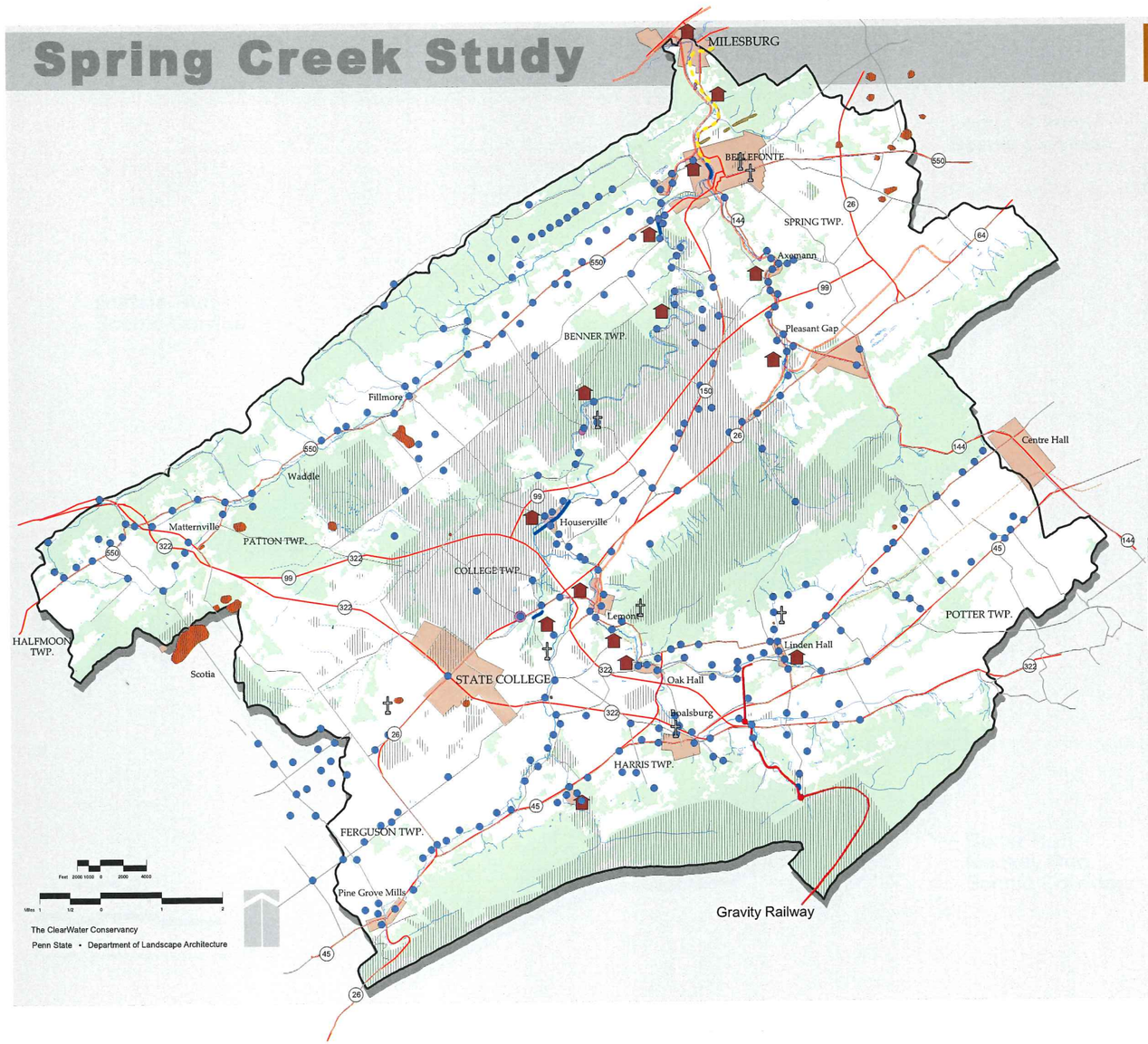


Agricultural landscape

Urban landscape

Riparian forest buffer

Spring Creek Study



Historic and Cultural Resources

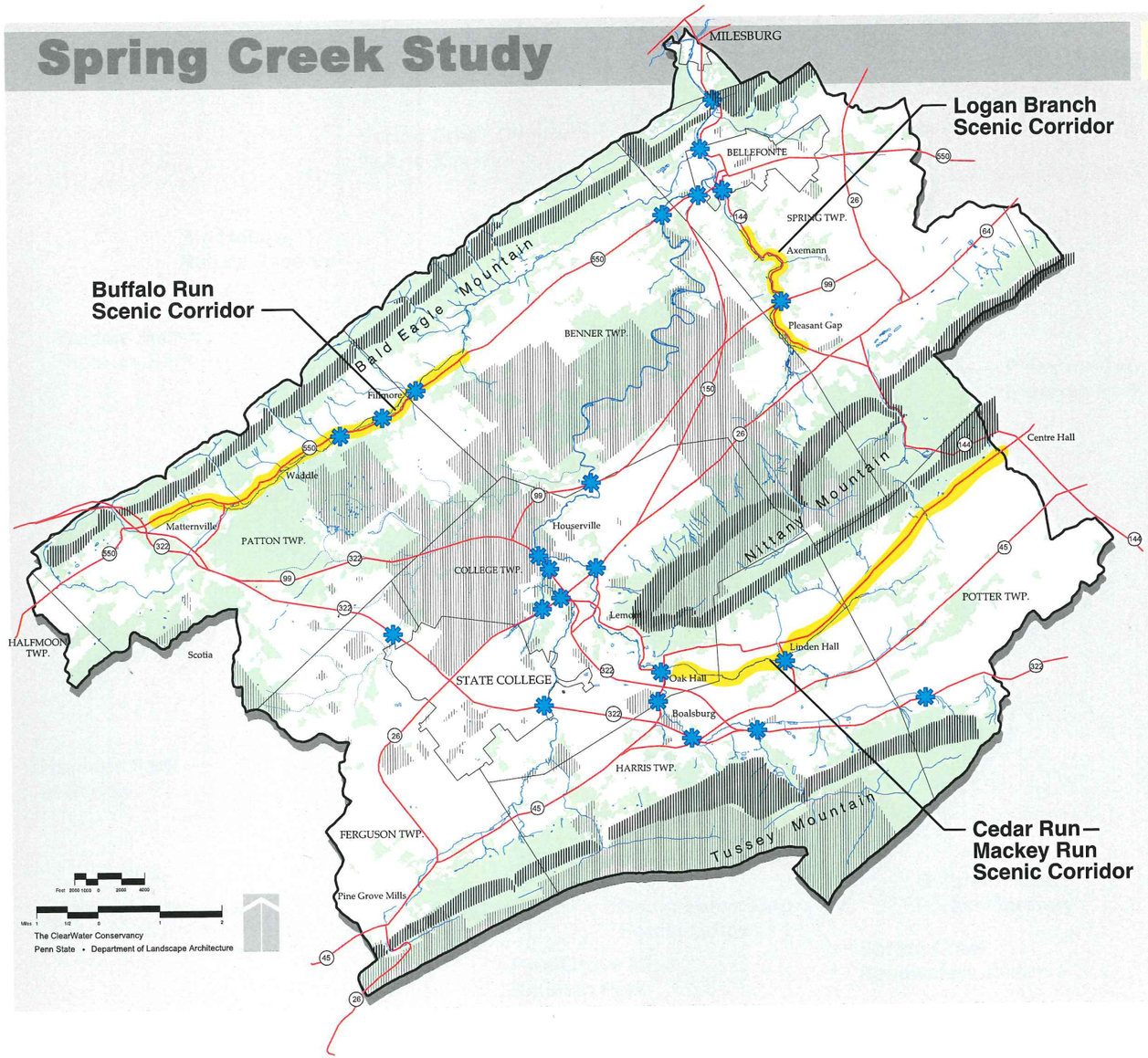
- **Acknowledge and inventory evidence of the past**
- **Develop with history**

- Navigation canal
- Cemetery
- Location of iron furnace or forge
- Location of grist mill
- Inactive railroad
- Active railroad
- Iron mine
- Mill race
- Historic quarry
- Roads in 1874 Atlas of Centre County
- Structures in historic buildings survey
- Historic town or village

Logging steam locomotive circa 1900

Residential development preserving historic resources

Spring Creek Study



Scenic Resources

Conserve forested mountains

Scenic valley facing slopes

Protect scenic corridors

Scenic corridors

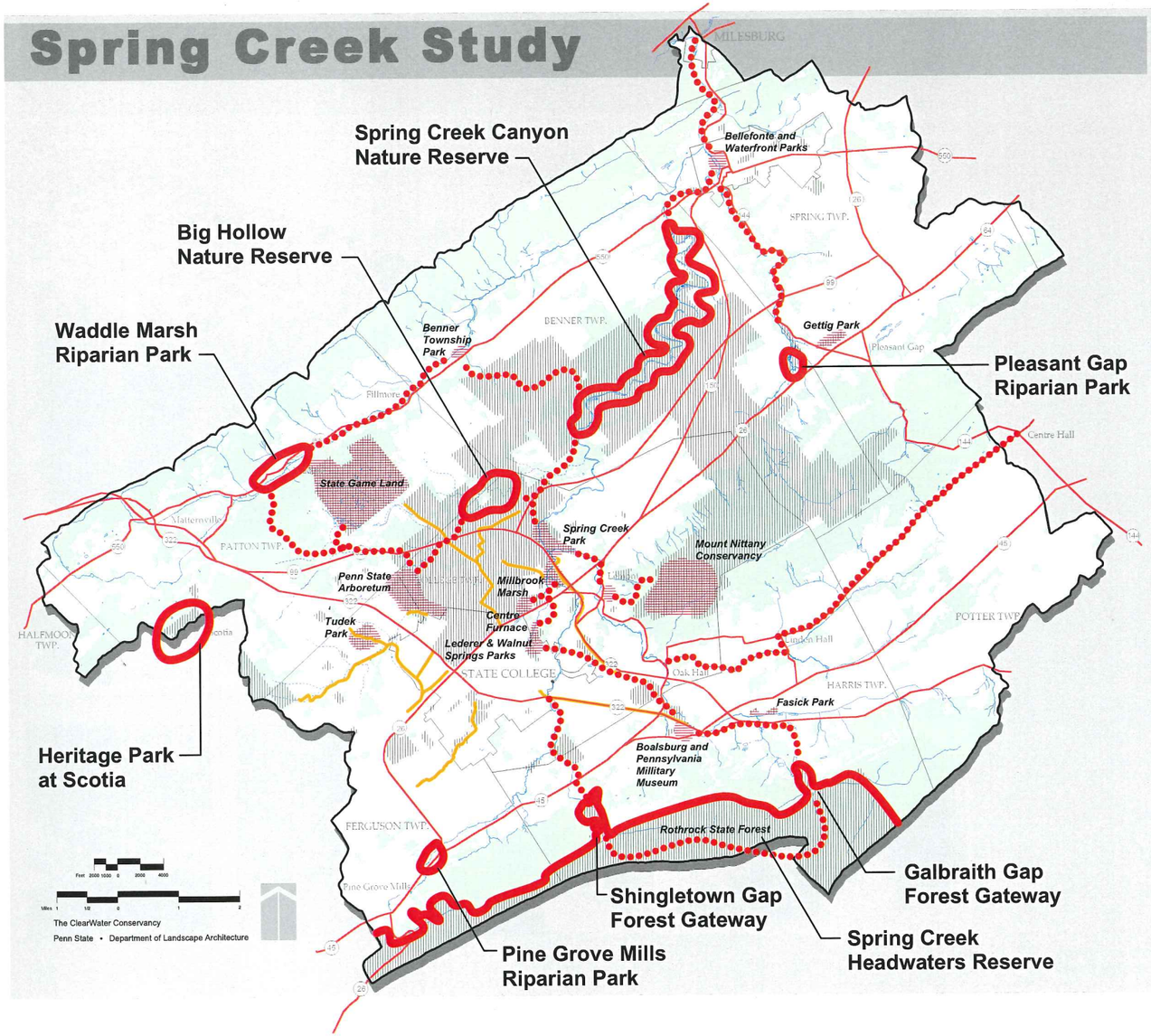
Enhance visual access to Spring Creek and tributaries

Important view to stream

The stream from the road

Scenic valley facing slopes

Spring Creek Study



Recreational Networks

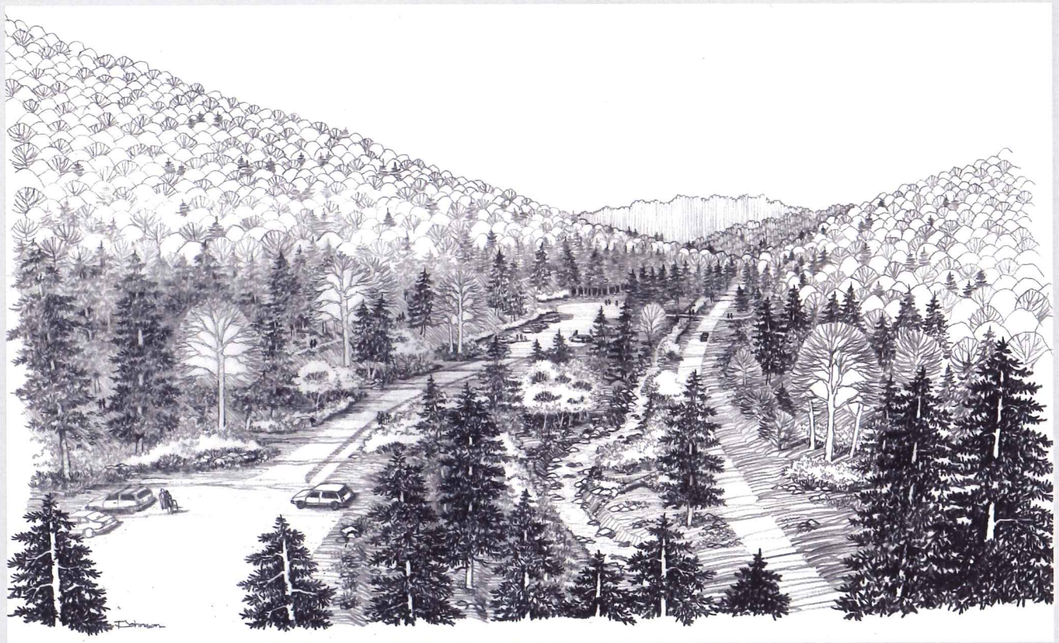
Establish new recreational destinations within and beyond the watershed

- Proposed recreational destinations
- Existing recreational destinations
- Existing public land

Enhance recreational connections

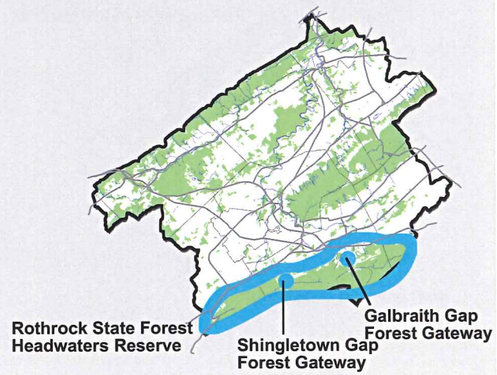
- Proposed recreational access
- Existing bikeways

Spring Creek Study



Headwaters Reserve

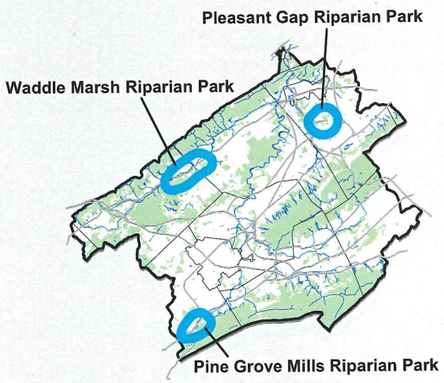
- Protect headwaters
- Establish forest gateway
- Reveal and interpret history
- Enhance scenic value
- Establish partnerships for conservation



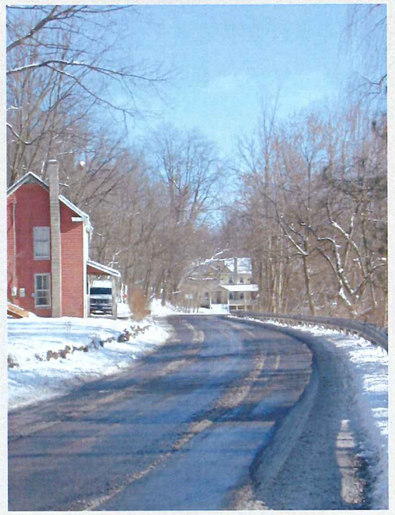
Spring Creek Study

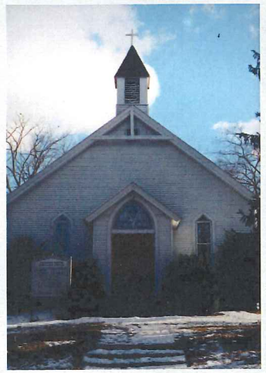
Riparian Parks

- Create new parks
- Protect riparian areas
- Create Ribbon of Green
- Provide access to nature



Spring Creek Study

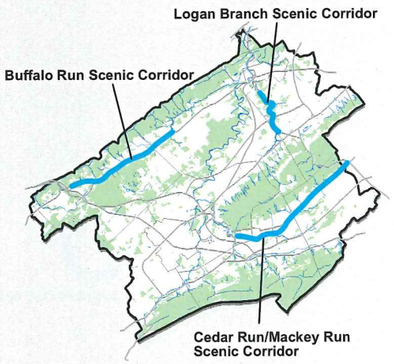




Scenic Corridors

- Value the view from the road
- Protect cultural, natural, and scenic resources
- Preserve historic road alignment
- Establish special management and design standards

Scenic Corridor



Spring Creek Study

Heritage Park at Scotia

- Protect, reveal, and interpret all eras of iron mining history: Centre Furnace era, Andrew Carnegie era and World War II era
- Protect and interpret ecology of the Barrens
- Create recreational destinations